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AUTOMOTIVE INDUSTRIES
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VOL. XLVIII NEW YORK—THURSDAY, MARCH 1, 1923 No. 9

Road Capacity Is Chief Limiting Factor in Future Sales

Attempts to estimate number of potential purchasers by juggling income tax returns are foolish. Used cars, upon which there are no reliable statistics, must be considered.

By James Dalton

NUMEROUS economists and statisticians have amused themselves from time to time with more or less learned discussions of the potential market for motor vehicles. The tremendous production of last year has given renewed impetus to these considerations, although the theoretical "saturation point" is not fixed definitely as often as it was at one time.

These discussions are interesting, but they add little to the sum total of human knowledge for they leave out of the reckoning entirely the most important factor in any survey of the potential market for motor vehicles. That is the used car. In order to arrive at a destination, a statistician must have definite figures with which to work. He is helpless in this respect when he gets to the used car, even if he thinks of it at all, for there are no reliable statistics covering it.

Most of these practically useless discussions are based on the average price of new automobiles, which is somewhere around $770, and estimates of individual incomes, usually based on income tax returns. Here, again, facts are elusive. Theoretically, every person with a net income in excess of $1,000 tells the Government about it, but practically he doesn't.

One statistician has prepared a table purporting to show that approximately 31,000,000 American citizens are income receivers, but 16,000,000 of them earn less than $1,000. There are only 9,994,000, according to this table, who earn $1,600 or more. Some economists figure that no one who earns less than $1,600 can operate a motor car and eat, to say nothing of wearing clothes. But stretching a point, and assuming that anyone with an income of $1,500 can get by with a car, we can add only 1,671,000 more, making a total of 11,615,000.

Motor vehicle registrations last year totaled 12,364,000, including commercial vehicles. Assuming, arbitrarily, that 10 per cent of them were trucks,

REGISTRATIONS have proved worthless all efforts by economists to show the number of persons who can afford to own motor cars, because their conclusions have been drawn from incomplete data.

Used cars are motor vehicles, and no computations based on income figures can determine how many individuals can afford to buy them, because automobiles which are still serviceable can be purchased for as little as $25.

Statistical surveys made thus far by men outside the industry have disregarded entirely this determining factor.

which is as good a guess as any, we have 11,127,000 passenger cars. On this basis there were less than 500,000 people in the country earning $1,500 or more who weren't the proud possessors of a motor car. Obviously this calculation can't possibly be correct, for it is possible for almost anyone to check over in his mind the persons he knows making $30 a week or more and find a lot of them who don't own cars.

PROCEEDING from this premise, if the ideas of this economist were correct, the answer must be that a great many persons in the higher income classes own fleets of passenger cars or that there is a terribly large total of motorists who must be starving themselves to death for the sake of owning an automobile. There must be something wrong even with this calculation for there are only 1,409,000 incomes in excess of $4,000 and it probably will be admitted that a person must have considerably in excess of $4,000 a year to operate more than one car, without going into bankruptcy annually.

Coming down to actual income tax returns, the situation is even more amazing, on the face of it. Personal income tax returns were filed by 7,259,000 individuals for the calendar year 1920, the last for which the returns are available, and in that same year the registration of motor vehicles exceeded 9,206,000 Again deducting 10 per cent for trucks, there were 8,285,000 passenger cars. This meant that there were over 1,000,000 automobile owners who didn't file income tax returns. Not only that, but 5,241,000 of the returns were on net incomes of less than $3,100.

This condition was not in any sense impossible, however, for analysis of the income tax returns for 1920 shows that the typically farm States had a great many more motor cars than the returns would seem to justify. Kansas paid 1.4 per cent of the total income tax but owned 2.9 per cent of all the passenger cars registered. Iowa paid 2.5 per cent of the tax and owned 4.5 per cent of the cars, while Nebraska paid 1.8 per cent of the tax and owned 2.5 per cent of the cars.

The situation in typically industrial States was entirely different. Massachusetts paid 5.6 per cent of the tax total and owned 3.2 per cent of the cars. Ohio paid 6.2 per cent and owned 6.8 per cent, while Michigan paid 4.2 per cent and owned 4.7 per cent.

It is obvious, therefore, that a great many farmers who fail to report a net income of $1,000 or more can afford to own motor cars. The farmer who has paid all the living expenses of his family and has $1,000 left is better off than the city man with an income two or three times that size who has to pay all his living expenses out of it. That is the reason for disproportionate ownership of automobiles and income tax payments in the agricultural States and it shows how futile it is to try to determine by income tax returns the number of persons who can afford to operate cars.

One of the factors which limits the increase in motor vehicle sales in highly congested population areas is "fixed charges," which include such items as garage fees, cost of license and insurance. They are fixed in the sense that they do not vary with the care given the car and in that respect they cannot be considered as operating expenses. These fixed charges, with the exception of the license fees, increase with the density of population. Hence the dweller in the largest cities finds the fixed charges are the minimum expense of owning a motor vehicle and the minimum may be well above the cost of a used car. Urban dwellers who are forced to figure closely to permit the ownership of an automobile may find the item of fixed charges and not the cost of the car the deciding one.

Speaking of the country as a whole, however, casting aside theories and getting down to rock bottom facts, the only really limiting factor for the sale of motor vehicles in the United States for several years to come, is the capacity of the roads to carry them. For all practical purposes, therefore, the final limit will have been reached when every family owns a car, disregarding the most densely populated cities where high fixed charges always will keep the car-per-capita figure low and where an increase in street areas is practically impossible.

FOR the country generally, the only factor really limiting the sale of motor vehicles is the ability of the roads to carry them. This element is complicated in highly congested population areas, however, by high fixed charges, such as garage fees.

Every mile of new road opens a new market and the time will come when every family will own a car except in the largest and most densely populated cities.

Road building in other countries means a constantly expanding market which should be held by American makers.

Use of commercial vehicles is still in its infancy and the ratio of production in relation to passenger cars will increase steadily.

It is estimated that there now are 20,000,000 families in the country and the number is increasing each year. When every family, outside the most congested centers, does own a car, first sales will be governed by the increase in population.

The normal registration trend indicates that the 20,000,000 mark will be reached in 1930. By that time the population will be about 120,000,000. Averaging five persons to the family, which is a liberal estimate, there would be approximately 24,000,000 families and there still would be some distance to go before everyone had a car.

AS the first buyers' market diminishes from year to year the replacement market will increase in equal or greater proportions. A good many people within the industry, but not many outside it, have tried to establish some logical basis for determining the present size of the replacement market, but no really reliable statistics have been produced. Those now in use usually are based on the assumption that the average life of a car is from five to six years. If such were the case, the replacements in 1922 would have approximated the total passenger car production five years previously, which was 1,740,000 in 1917, or six years ago, which was 1,493,000 in 1916. On the same basis the replacements in 1923 might be 926,000, which was the output in 1918, or they might be 1,740,000, the production in 1917. The National Automobile Chamber of Commerce estimates that the figure will be 1,900,000.

It is apparent, however, that no arbitrary methods can be established for computing the life of a car. It depends entirely on the car. The only one on which statistics could be worked out with any degree of accuracy would be the Ford, which has been practically unchanged for several years. In other lines models have been

changed almost every year. It is the boast of some makers that their cars never wear out and judging from the appearance of some still in use the contention is justified. Much depends, nevertheless, upon the care given them by their owners and the character of service they get.

The term "replacement" often is misused, even within the industry. Accurately speaking, it means a new car purchased by some one to take the place of an old car which has outlived its usefulness and gone to the junk heap. In many cases, however, it is used in referring to the new car bought by an owner to take the place of the perfectly good used machine which will be sold to some one else and which may be run three or four years longer.

THE automotive industry is young. Conditions even five years ago are not comparable to those which prevail today. One man's guess about the future is as good as another, provided they are based upon an equal degree of familiarity with all the factors involved. The National Automobile Chamber of Commerce predicts a production of 2,700,000 cars and trucks for 1923. We don't believe it will run as high as that. If it does it will approach the present productive capacity of the industry and that capacity probably would be great enough for any future needs if it were properly distributed. The figure last year was almost 2,600,000. It probably will slip a little this year and then range between 2,500,000 and 3,000,000 for a considerable period.

Up to this point, like the statisticians, we have considered only the new car, but the used car, as everyone in the industry will learn sooner or later, cannot be ignored. There are no reliable statistics on used car annual turnover but it reaches huge proportions. One estimate, which seems the most reliable of any, is that the automobile dealers of the country bought about 1,600,000 of them in 1922. Every purchase pre-supposes a sale because dealers don't cherish them any longer than necessary. This means that, with the 2,300,000 new cars they sold, dealers alone handled 3,900,000 passenger vehicles in twelve months.

Not all the used cars, by any means, were sold by dealers in new cars. A great many thousands more were handled by used car merchants and were sold by one owner direct to another. This is one of the reasons why it is impossible to compute with any degree of accuracy the number of persons who are financially able to own a car. It is possible today to buy a car which will run for as little as $25. If the buyer has a little mechanical ability he can put it in such condition that he can get a great many miles out of it.

IT will be conceded that almost every family wants a motor car. It is a fact, also, that a usable car can be purchased today for whatever arbitrary sum may be apportioned for the purpose, from $25 up. The family which has no car spends a certain part of its income for healthful and helpful relaxation. In countless cases the money which might be spent for a summer vacation will pay for an automobile which possesses a certain amount of quality and the regulation vacation will be forgone. It also will take the place of the movies and other things in the summer time so that its original cost will be made up the first year. All that is left is maintenance and there are a great many users who do their own servicing.

Before any motor car goes to oblivion on the junk pile the chances are that it will pass through a good many hands, each transaction involving a smaller sum. For that reason there can be no reasonable computation of the number of potential purchasers in the country unless the used car is considered, for a used car, no matter how old it may be, is just as much a motor vehicle as one fresh from the factory.

It must be accepted, therefore, that the only really limiting factor in the way of sales at this time, considering both new and used cars, is the highway capacity. It must be admitted that a good many roads in the vicinity of large centers, as well as many miles of city streets, are approaching the saturation point. This is especially true in New York and on the roads radiating from it.

But every mile of improved highway which is built opens up a new market for motor cars. This applies with almost equal force to other countries. American manufacturers have the motor vehicle markets of the world in their grasp and if they exercise ordinary intelligence they can keep them. Other countries are beginning to build roads and the day may come when the export market, which scarcely has been touched thus far, will take a very large percentage of the number of cars sold each year in the United States. It is likely to be the foreign trade which will determine whether the present productive capacity is large enough.

It is easier to speculate about passenger cars than about commercial vehicles for there are more statistics concerning them, but speculation about the truck market of the future is a fascinating pastime. Those who have studied it most closely believe that the time will come when it will approach the motor car in the size of its annual turn-over.

UNDOUBTEDLY, as the need for transportation expands from year to year, the percentage of truck output will steadily increase in comparison with passenger car production. Highway transport is still in its infancy and the 10 per cent ratio which prevailed last year will not hold long. It is likely to go up this year unless there is a sharp change for the worse in general business conditions and the day will come when it will be as high as 25 per cent of the total.

No one knows the length and breadth of the motor vehicle market and there is no basis on which to compute it accurately. There will be none until it becomes stabilized and remains so for several years. In the meantime, no matter how interesting the computations of economists and statisticians outside the industry may be, they should not be taken too seriously. Those within the industry, of equal ability, who have devoted years to its study, admit frankly there are a great many factors they know nothing about. Their forecasts are made carefully and studiously for they are not ventured at all until there is substantial foundation for them.

Bureau to Study Concrete Roads

ACTUAL stresses in concrete road slabs and subgrade conditions beneath are to be investigated in many States by the Bureau of Public Roads of the United States Department of Agriculture. A truck is now being equipped with suitable apparatus including a graphic strain gage and autographic deflectometer especially developed for the purpose. Data to be collected will include soil and moisture condition of the subgrade, design of slab, direction and magnitude of stresses and deflection of slab under legal limit of loading as well as other loadings.

This investigation is to start early in the spring and some of the Southern States will be visited first. Valuable information should be secured as to the strength of different types of design.

Personal Fear Is Greatest Handicap to Commercial Flying Growth

Col. Frank Searle, noted transportation expert, says passenger air lines cannot compete with land transport media capable of 30 m.p.h. Time saving means future success. Special planes needed. War traditions must be forgotten. Better pilots desired.

By David Beecroft

PERSONAL fear is the greatest present handicap to the development of travel by airplane, in the opinion of Col. Frank Searle, managing director of the Daimler Airway, a British concern operating a line of airplanes from Manchester to London to Amsterdam. Col. Searle, now on a business trip to America, reached this conclusion when airplane traffic failed to increase after he had placed the fares for travel between London and Manchester at the same price as the railroad fares.

He continued carrying three persons per day between these cities. The argument of time economy did not overcome the factor of fear. The ten-passenger DH 34 planes operated by Col. Searle made the 200 miles between these British cities in 1 hr. and 55 min. as compared with 4 hr. and 15 min. by railroad. These figures do not include time spent at both ends reaching the airdrome by taxicab.

Col. Searle became convinced of the dominance of fear in aerial travel by his experience with the Manchester-London route. His findings were substantiated by similar experiments with the London to Amsterdam line. He made the London to Amsterdam airplane fares equal those of the railroads and steamboats, but no increase of aerial travel resulted. Airplane travel was much quicker, however, than the rail and steamboat trip. Planes made the trip in 4½ hours, leaving Manchester at 9.30 a. m. and reaching Amsterdam at 2 p. m. With the combination train and boat it was necessary to leave Manchester at 3 p. m. in order to arrive in Amsterdam the next morning at 9 a. m.

Pioneer in Motor Transport

These conclusions drawn by Col. Searle cannot fail to carry conviction. He is one of the greatest motor transportation organizers in the world. Previous to entering the motor industry in 1902 he had long experience in railroad transport. He organized and put on a business basis the London General Omnibus Company. George A. Green, vice-president and general manager of the Chicago Motor Coach Co., is a student of Searle's, having worked with him in London before coming to America to take charge of the Fifth Avenue Coach Co. in New York. During the war Col. Searle had complete charge of the maintenance of British tanks in France. He called on Green to assist him with the task. Both men received their military rank through these services. Thus, Searle's conclusions regarding the public and aerial transport have been reached on a basis of long experience in transportation matters.

Col. Searle entered aerial transport immediately after the war. For years he had been associated with the Daimler Company, Coventry, England. Soon after the Armistice the British Small Arms, a large holding company, one of whose properties is the Daimler, purchased the Aircraft Manufacturing Company and its operating organization, the Aircraft Travel and Transport Company.

War Machines Unprofitable

Col. Searle was asked to investigate the condition of aerial transport in general and of this company in particular. He found the company endeavoring to carry on commercial aviation with war machines. It had lost $875,000 in one year on the twenty-two machines that it was operating. Searle recommended that the business be shut up and that no further effort be made to use war machines for business aviation.

At the end of a year Searle was ready to start commercial flying with three specially built DH 34 machines. These planes were designed to carry ten passengers, including the pilot, together with a quantity of mail and other freight. With them and with some more since added, he has reached many interesting conclusions concerning commercial aviation.

He does not believe there is any possible opportunity for successful commercial passenger aviation where a competitive system of transport offers an average speed of 30 m.p.h. He recommends that commercial passenger aviation refrain from attempting to compete where such service exists. Naturally the best airplane route afforded would be across the Atlantic where steamboats average only 25 m.p.h.

On the Chicago-New York route where railroads average 45 m.p.h. Searle does not see much hope for a passenger airplane line.

Col. Searle is a confident believer in the future of passenger airplane travel because of its time economy. He expects to continue in the business so long as the British subsidy plan enables him to operate and make money. Nevertheless, he does not hide any of the facts concerning costs and the problems to be faced.

The majority of traffic on European airlines today consists of tourists. The business man has not begun to use the plane consistently. Col. Searle has kept com-

plete cost figures which include every item, such as depreciation, insurance, overhead and maintenance. With these data he has established certain bogeys as to flying costs. He says:

"If we fly 62,000 miles per year per machine, our best cost will be $1.15 per mile per machine flown.

"If we increase the distance to 125,000 miles flown per year per machine, we reduce the cost to 77 cents per machine, per mile flown.

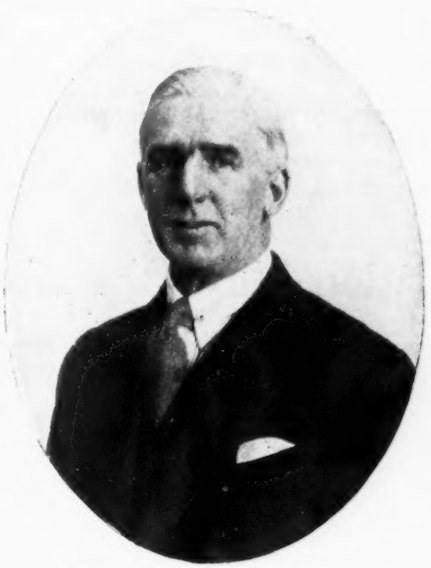
"If we further increase the mileage flown per year, per machine to 190,000 we still further reduce the cost per machine, per mile flown, to 64 cents."

Success Depends on Steady Operation

These figures apply to the DH 34, ten-passenger machine, of which he has been operating four. They are applicable, however, regardless of the number of machines flown over a given route. The machines cost $30,000 each, including all necessary equipment.

Steady flying is essential to success. It is utterly impossible to fly an expensive machine but 30 miles a day and expect to make money. Such a venture would ruin even Wall Street.

Col. Searle criticized the U. S. Postal Service in a speech made at a luncheon of the Association of Aeronautic Executives a short time ago. In a recent report the Postal Service claimed 94 per cent efficiency in the operation of its planes. The Postal Service is operating 70 machines, according to Col. Searle, and the average distance flown is 64 miles per day. Yet these machines are capable of 100 m.p.h. Operating an airplane on such a limited daily mileage he said, is similar to taking one of the motor buses of the Fifth Avenue Coach Company, operating it on the streets of New York for 1 hr. a day, during which time it would travel 11 miles, and expecting it to make a business success.



Colonel Frank Searle, managing director of the Daimler Airway, now on a business trip in this country

Col. Searle believes that business planes must average 500 miles per day and sometimes as high as 750. One of the planes Searle operates on his Manchester-London-Amsterdam route, has flown 115,000 miles in 10 months, an average of over 380 miles a day and it is still as good as ever. He scouts the report that no airplane can fly over 250 hours in a year and says that a machine must at least fly 1200 hours per year to be a business success. Previous to Searle's having one machine fly 110,000 miles in eight and a half months, the best record of a single machine was 80,000 miles in three years.

The problems involved in aerial transport are similar to those found in connection with other transportation media. It is chiefly a question of organizing equipment, using it the maximum number of hours, and maintaining it in the best possible condition.

Col. Searle cites a good example of the importance of organization in operating a commercial air line. On the London-Paris line the ground organization at the two terminals were of the crudest character in some respects. After a run of 240 miles between the two cities, the gasoline tanks of the machines, containing upward of 100 gal., were filled from 2-gal. gasoline cans. Filling required 2½ hours from the time a plane landed until it was ready to start its return flight. Approximately 90 per cent of this time was pure waste due to the inefficient methods of handling the plane. Searle was able to reduce this time to 20 minutes and established a record by making four trips per day across the channel with one machine.

In this short space of 20 min. supplies are taken on and the plane is given a careful inspection. The oil filter and gasoline filter are removed from the engine and new ones are inserted. The oil filter is examined under a microscope. If the examination reveals a single small particle of white bearing metal, the engine is taken out and not allowed to make another trip. Inspections of this nature have made it possible not to have a single forced landing since Searle assumed control.

Engine maintenance was one of the most important organization problems. The system calls for 100 per cent spare engines from the start. The company uses the Napier Lion, a 450 hp. unit. Engine maintenance costs $16 per hour flown. It costs $5 per hour flown to maintain the rest of the plane. The original cost of the engine is approximately one-half that of the plane.

Immediately following the war it cost more per hour to maintain the control wires for operating the ailerons and rudder than to maintain the engine. The system of these wires had to be entirely changed for commercial work. Some of the planes being used for commercial work moreover, had twenty-two pieces of India rubber piping between the gasoline tank and the carbureter, another reason for high maintenance cost. In the design of the plane no effort was made for rapid demountability of the units; maintenance had been given little consideration.

Col. Searle is firmly convinced that commercial aviation can never be successfully carried on with war machines and war-made engines. In the commercial plane everything has to be scaled down to provide for an adequate load on which to make profits. Manufacturers should give more attention to this and should be more conservative in rating the load-carrying capacity of their machines.

Subsidies Still Found Necessary

British commercial aviation could not be maintained at present without the subsidies furnished by the Government. These are as follows:

London-Paris route £15,000 per year.
London-Brussels and Cologne £25,000 per year.
Manchester-London-Amsterdam £55,000 per year.

Each company has to fly a definite number of miles to obtain the subsidy, the necessary mileage on the Manchester-London-Amsterdam route being 255,000 per year.

Under the subsidy arrangements each company must fly one-quarter of its mileage in the six winter months and three-quarters in the six summer months. Four machines are kept in constant service to accomplish this on the Manchester-London-Amsterdam service.

Col. Searle does not believe there is any possibility of operating commercial planes as a business success without a government subsidy. A commercial plane can be operated on an average of 500 miles per day if the operat-

ing company has 100 per cent spare engines and 25 per cent spare machines.

The number of passengers carried on the Manchester-London-Amsterdam route since the subsidy arrangement started in October, 1922, is:

October.....	Manchester to London.....	54 passengers
	London to Amsterdam.....	92 "
	Pounds of goods	27,863
	Mileage flown	11,231
November....	Manchester to London	131 passengers
	London to Amsterdam.....	58 "
	Pounds of goods	4,243
	Mileage flown	12,457
December....	Manchester to London	37 passengers
	London to Amsterdam	27 "
	Pounds of goods	4,006
	Mileage flown	13,438

These planes are not popular as mail carriers. During November 1 lb. of mail was carried from London to Manchester. From London to Amsterdam 150 lb. were carried. During December no mail was carried from London to Manchester and only 25 lb. from London to Amsterdam.

Suitable pilots are difficult to get at the present time. Most of the pilots available are war flyers and in the words of Searle are literally "terrible persons." He describes them as being generally the self-satisfied people who think they know it all. Very few are the capable navigators needed in successful commercial aviation. They can follow railroad tracks or rivers and thus get from place to place, but scarcely any of them can pick their course above clouds.

The air pilot is paid £1 per hour of flying and in addition gets a yearly retainer of £100. British commercial pilots average £650 per year. Six pilots are maintained to operate the four machines.

Col. Searle is convinced that the greater speed possible with planes is certain to make successful this new form of transport, but that development will be long and difficult. So far in the history of transportation every vehicle type which increased the speed previously possible has gained and established its position. Perhaps the greatest handicap facing commercial aviation is the tradition of the war. That must be forgotten. To make a success of commercial aviation it is necessary to get into the channels of regular transportation and apply these principles that have brought success in the older fields of transport.

Commercial Aviation Must Reduce Overhead Costs

BRITISH airplanes in 1922 carried from 75 to 80 per cent of the passenger traffic from London to Paris and the percentage of total flights of British machines completed in less than four hours was maintained at over 90 per cent from February to September, exceeding 95 per cent in July, August and September, figures which show a great improvement on previous years. The all-year-round percentages were: 1920, 75; 1921, 85.6; 1922, 89.7. These facts were brought out in a paper presented by F. Handley Page before the British Institute of Transport.

Accompanying the paper were tables showing the records of various European services.

In regard to cost of operating services Handley Page said in part:

"The actual costs at the present day vary considerably and are dependent on whether the aircraft are used in an extensive manner or whether a large fleet is used with a large number of machines in reserve but not used.

"The cost of air transport to-day is mainly due to the minimum cost of the general charges that have to be maintained if a service of any description is run. For an increase in the size of the service by two or three times, there will be nothing like a corresponding increase in the running cost."

Dealing with probable future developments Handley Page said:

"If civil aviation is to be run on its own feet, without subsidy, although the first necessity is expansion of services so as to reduce overhead charges per passenger or per pound of freight, yet, at the same time, there is ample scope for improvement in machines. Today the average covered aircraft carries between 15 and 17 lb. for every horsepower installed, of which, at the outside, 4 to 5 lb. per horsepower is the useful or paying load. The cruising speed varies between 85 and 100 miles per hour. It should not be impossible within the next few years to increase the total carrying capacity for the same top speed to, say, 25 lb. per horsepower, and obtain a useful load of 10 lb. per horsepower. If this were done the cost per ton-mile would be reduced."

As regards the carriage of freight by air neither Handley Page nor those who contributed to the discussion were at all optimistic. They agreed that it was not likely to be a paying form of load except over long distances, owing to the trouble, time and cost involved in collecting and delivering from and to air stations.

Tables Showing Records of European Services

Paris, Brussels, Amsterdam Air Route (French, Belgian and Dutch Aircraft)

	Flights made	Kilometers flown	Passengers carried	Freight in lb.	Mail in lb.
1919.....	497	101,789	193	9,277	470
1920.....	388	110,245	371	3,825	495
1921.....	814	310,710	2,010	45,148	1,245
1922.....	503	138,615	1,224	83,914	1,038

(Up to Oct. 31, 1922.)

Paris, Strasbourg, Prague, Warsaw, Bucharest, Constantinople Air Route (French Aircraft)

Year	Kilom. flown	Passengers	Freight, lb.	Mail, lb.
1920 (Sept.-Dec.)...	59,252	15	1,115,875	142,494 (1)
1921 (Jan.-Nov.)...	606,514	1,328	70,206,708	3,191,218 (2)
1922 (Feb.-Nov.)...	898,972	933	74,618,060	5,111,920 (3)

(1) Paris, Strasbourg, Prague.
(2) Paris, Strasbourg, Prague, Warsaw.

Traffic on Toulouse, Casablanca Air Route

	Flights made	Kilometers flown	Passengers carried	Freight in lb.	Mail in lb.
1919.....	250	107,470	41	1,491	391
1920.....	923	366,049	223	21,885	7,517
1921.....	1,900	692,415	455	56,221	14,755
1922.....	2,270	840,406	739	73,832	54,989

Trippensee Uses Sub-Assembly Methods in Building Sedan Bodies

Save time and increase earnings of both factory and laborers by keeping same men continually repeating same operations. Larger number of small jigs for each sub-assembly requires fewer large jigs for final assembly of Rickenbacker bodies.

By J. Edward Schipper

BY using more sub-assemblies in framing, body manufacturers are obtaining superior results at lower cost. Men who can or will frame an entire body are becoming scarce. Instead of having from two to five men frame almost an entire body on a single buck or jig, it is becoming customary to use a greater number of smaller jigs for sub-assemblies. These units are brought together in the final assembly buck. The new method, according to experienced body builders, saves time and increases the earnings of both factory and labor. Another effect is that the number of final assembly jigs is materially reduced.

The Rickenbacker sedan forms an interesting subject of study as an example of modern methods of body assembly. This body is manufactured by the Trippensee Mfg. Co. Since the production is moderate, such methods as progressive framing, sectional manufacture and other plans which are being investigated in large-scale body plants do not enter into consideration. Experience has shown, however, a number of economy provisions which approximate the results of progressive quantity manufacture even with small scale production.

It requires some 5000 operations to completely manufacture this sedan. A great number of these are performed in the wood working plant. Here the pieces are formed with the customary machines and sub-assemblies to a slight degree. Altogether there are about forty sub-assemblies. These come together and form eight major sub-assemblies which meet at the main buck or jig where the final assembly is completed.

Advantages of Sub-Assembly Methods

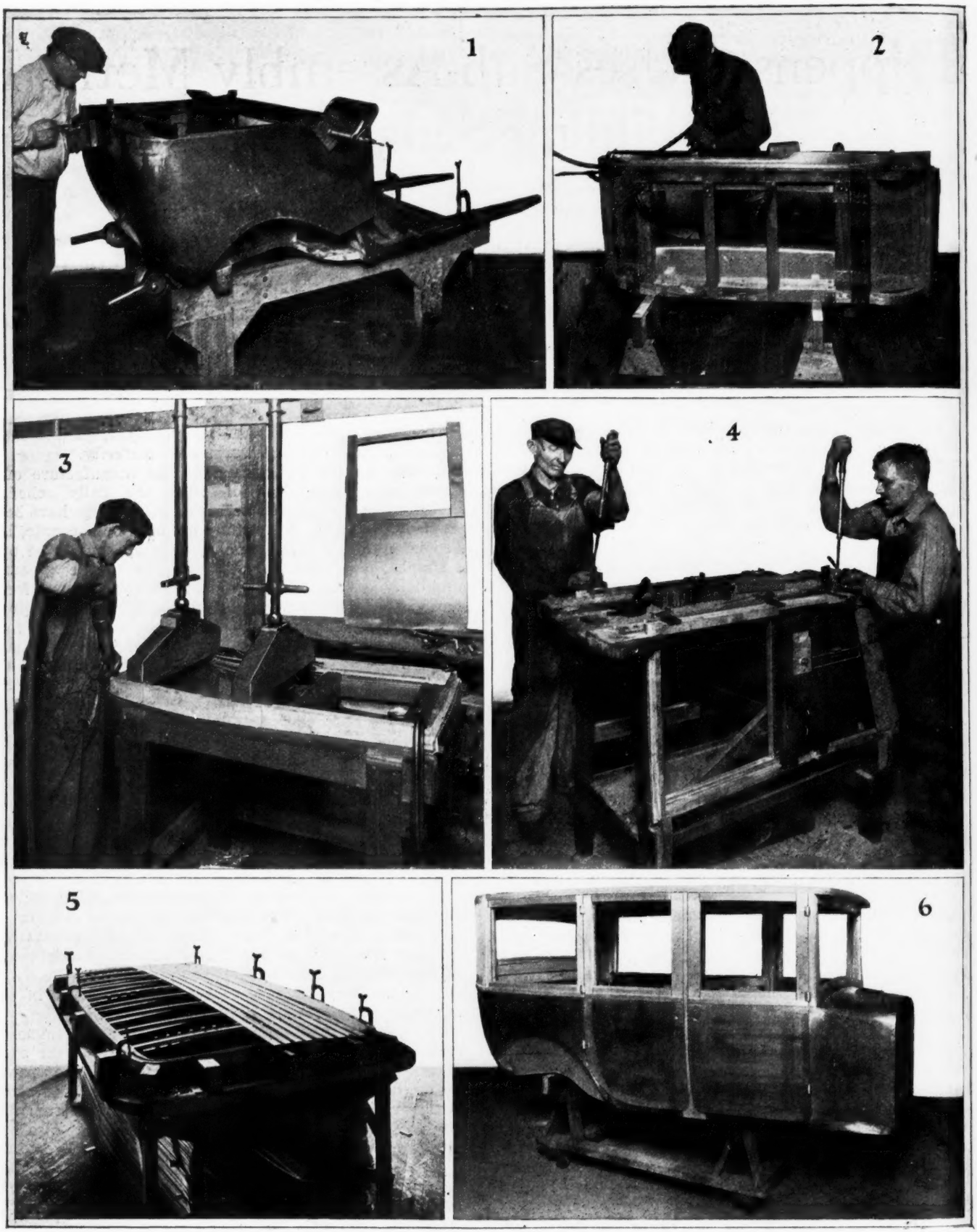
By working the bodies through in sub-assemblies virtually the same effect is gained as though a progressive system were employed. The men become accustomed to a few operations, repeated at close intervals, in contrast with a great number of operations at wider time intervals. Consequently it is far more feasible to put the men on piece work and thus enable them to earn more money with a greater per capita production. The experience of the Trippensee company has shown that apparently the further this sub-assembly method is carried the lower the unit cost becomes. It is obvious that a man who is performing two or three simple body frame assembly operations over and over will reach a degree of deftness far beyond that attained by another who performs these same operations in addition to a great many others. The man makes more money because he becomes more adept and the company makes more because it profits by the workman's dexterity.

Success or failure in handling the manufacture of a closed body, regardless of what the daily schedule calls for, depends upon whether or not the jigs have been properly designed. They must not only be accurate, but also be rigid. A body-framing buck appears to be only a simple wood structure, but in spite of the apparent simplicity of the construction, it is not unusual for a good jig to cost between $1,500 and $2,000. The property of rigidity must be possessed not only by the final assembly jig, but also by the jigs used for the sub-assemblies. If it is not, the manufacturer will have the disconcerting and expensive experience of having the sub-assemblies apparently fit their own jigs, while they will not go together in the final assembly jig. The reason is that the spring in the body wood has been sufficient to distort the sub-assembly jig which has not been made sufficiently rigid. It is not unusual to employ cast iron reinforcements in connection with the jigs used on the Rickenbacker closed cars and these have proven successful in preventing distortion.

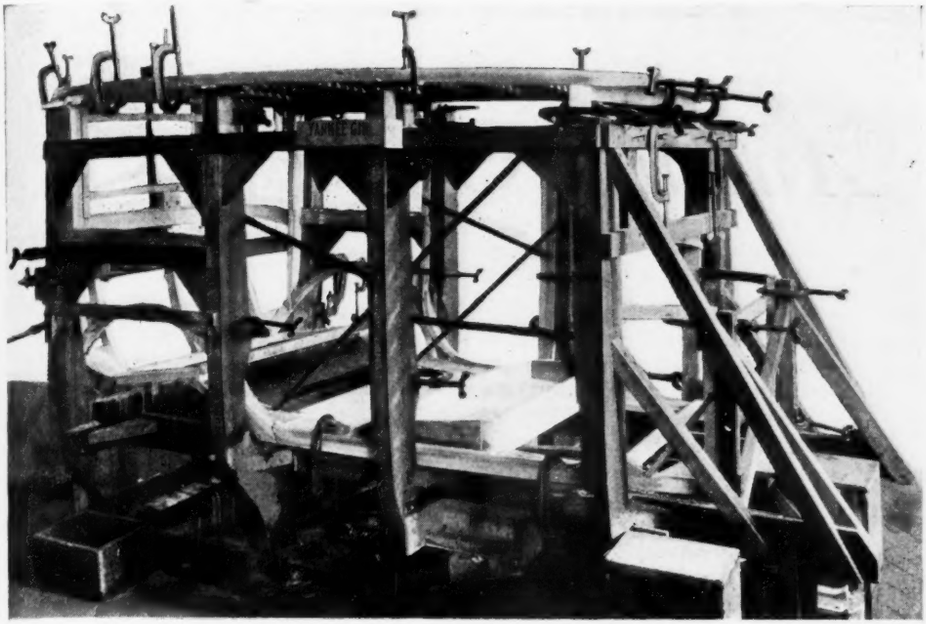
Bodies Are of Standard Type

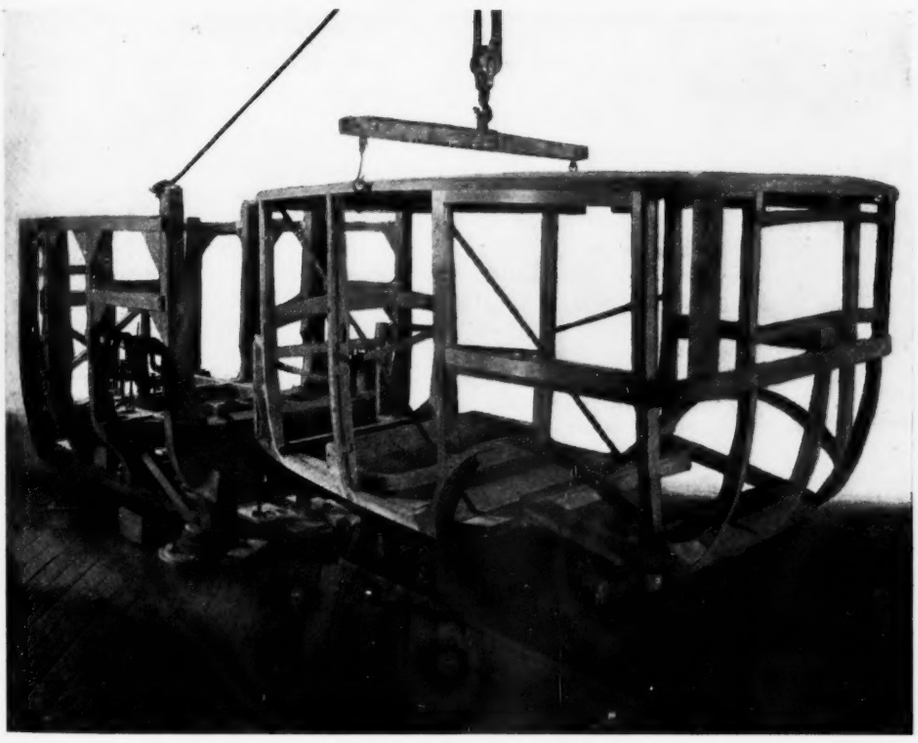
The wood work on the Rickenbacker sedan follows standard practice. The sills are somewhat unusual in that they are not deep. The policy of the Rickenbacker company has been to put the structural strength into the frame which is 8 in. deep, thus permitting the sill to be kept shallow with a consequent reduction in the height of the body.

The metal panels for the sedan are hand hammered. They are steel with the exception of the top rear panel which is aluminum. After hammering, the panels are fitted to jig forms in which they are held to strict interchangeability. The upper panel of aluminum and the lower of steel meet on the belt line. There is a belt strip or molding of aluminum which covers the butt joint. To preserve the smoothness of finish on the belt molding the holes for the nails are spun in, upsetting the metal in such a way that the resulting burr can be hammered back over the nail, leaving it in such condition that it is impossible to determine the points at which the belt strip was nailed. The belt strip is first struck with a sharp punch from the under or contact side, thus forcing the metal up in a hemispherical welt on the upper side. The nail holes are then spun into the welt with a conical tool. This leaves a corresponding conical hole



1—Fitting rear panel for Rickenbacker sedan to jig to secure correct shape before assembly. 2—Forming aluminum top rear panel of Rickenbacker sedan in jig with air hammer. 3—Mounting panel on door by flanging it over metal strip which acts as retaining flange. 4—Aligning jig used to properly line up the hinge pins for the Rickenbacker sedan door. 5—The roof of the Rickenbacker sedan is a sub-assembly as far as the framing is concerned. The jig herewith illustrated is employed for this sub-assembly. 6—Complete body as it leaves the Trippensee Mfg. Co. to be handed over to the painters and trimmers





Above—Main set-up jig or buck where the eight sub-assemblies comprising the Rickenbacker sedan are brought together. Below—Complete frame-up of the Rickenbacker sedan body as it leaves the main set-up jig. The body is now ready for the panels to be put on and the doors to be hung

into which the nails are hammered. A few sharp taps with a hammer on the welt or burr restores the metal in such a way that the usual hand filing renders the nailing points invisible.

The doors are important sub-assemblies and are handled in a door department which delivers them to the door hanging department in completed form. The doors are framed on a jig held to close limits so that all doors are interchangeable. After assembly the door framing is shaped all the way around on a shaper. A metal plate is then screwed on the door frame. The plate projects around the door as a metal flange. The metal door panel is placed against the door frame with this flange plate, in the jig. The edge of the panel is turned over the edge of the flange plate with an air hammer, thus anchoring it securely to the door frame. The assembled doors are filed and hand finished, after which the hardware is applied.

To secure alignment in the door hinges a jig is employed to hold the hinge pins in line. This jig is rigid and is so arranged that it is impossible for the workman to put the hinge on in any but the correct position. The result is that not only do the doors swing freely but they also fit when they arrive at the door hanging department.

There are separate assembly jigs for the eight main sub-assemblies. These sub-assemblies are: 1—underbody, including sills, floor boards, etc.; 2—left quarter; 3—right quarter; 4—front; 5—roof; 6—back; 7—back light; 8—seat riser. These all come together on the final assembly buck or jig, upon which two to five men can work, depending upon the necessity for rushing the work. The main assembly buck is designed for great rigidity. The sub-assemblies are clamped in place, then screwed and glued together in the customary manner. Temporary retaining braces are placed inside the body during the process of framing. These are left inside the body when they are taken out of the framing buck and are not taken out until the upholstering is to be done. The metal panels and doors are put on after the body has left the buck.

By insisting upon uniformity and interchangeability of the metal panels no difficulty is experienced in having these fit the body frames. Each panel is either assembled on the part to which it belongs, as in the case of the doors, or it is checked for form in a jig which corresponds to that part of the frame on which the panel is mounted. The jigs, however are far more rigid than the frame itself need be. They are made from heavy pieces of hard wood capable of withstanding hard treatment without distortion. In a great many instances the final forming of the panels is accomplished by the use of air hammers. The jigs are made strong enough to withstand the blows required to thus form the metal plates. After the paneling is in place the bodies are taken to Everitt Bros. for paint and trim. Here the sedans are painted in accordance with modern practice for a first class paint job.

The foregoing is simply another indication that certain body builders are working more than ever toward methods which may sometime result in interchangeable production on a scale comparable to that which is common in chassis manufacture.

Just Among Ourselves

Purchasing Agents Fear "Runaway" Market

THE monthly market report prepared for members of an association of purchasing agents, including many representatives of automotive companies, contains this highly significant statement:

"A number of conditions point to a runaway market similar to that we had in the latter part of 1919 and the forepart of 1920. The strongest factor opposing this condition is the fact that most concerns in business and, what is more important still, the great majority of ultimate consumers, have learned a salutary lesson from that period. The ultimate consumer has learned that when prices go too high and he stops buying they are bound to come down again. On the other hand, the majority of concerns in business cannot resist the temptation to advance the price and get all they can out of the present moment rather than forego present profit for future safety. This means that in spite of all that is said to the contrary, for publication, many attempts will be made to boost prices just as high as they can possibly be forced. Whenever this does happen it spells D-A-N-G-E-R in capital letters in that commodity or industry."

Getting Dealers From Other Lines of Trade

THE Hudson Motor Car Co. is making an interesting experiment in attempting to attract dealers from other lines of activity. If it is successful, a good many other companies are likely to try the plan. Competition for the dealers already in the field is more brutal than it is for sales. Good motor car merchants are having so many blandishments lavished on them that their heads may be turned. The used car problem has kept many men experienced in other lines of trade from coming into the automobile business. They have shied away from a vocation in which most sales of new merchandise involve the acceptance of old on a horse trading basis. There are many other businesses, however, in which trading is more or less a custom and men familiar with these lines of trade soon can learn motor car selling. As a matter of fact they may know how to trade on a much saner basis than some men now selling cars. If a man with a reasonable amount of capital but no experience with motor vehicles will be content to work for a while as a retail salesman for a reliable dealer he probably can pick up all the information he will need to justify launching himself as a dealer provided he studies the service question simultaneously. If he doesn't give good service he might better stay out of the business and if he doesn't learn that fact he soon will go out, voluntarily or otherwise.

Revolutionary Service Plan Contemplated

WHILE the Hudson company is trying a novel experiment in relation to sales, another big company has in mind an even more revolutionary move in relation to service. This plan contemplates taking service responsibility away from the dealer and giving owners greater latitude in taking care of their cars themselves. Details of the system have not been worked out and no attempt will be made to carry it into effect for several months, but it contemplates a chain of parts depots where owners can get any part they may need for their car. They either can install it themselves or take it to any service station where they can be assured of good workmanship. Under the plan dealers can continue to carry parts stocks if they desire or they can get them as they are needed from the parts depots at a fixed discount rate. The individual car owner would buy at the list price.

Piez Wants Engineers To Get Into Politics

CHARLES PIEZ, president of the Link Belt Co. and formerly general manager of the Emergency Fleet Corp., expressed regret in a recent address before the Engineers Society of Western Pennsylvania, because engineers, as a class, exert so little influence upon public affairs.

"We have our agricultural bloc, our labor bloc and other blocs, all spelled in the newfangled way—BLOCS," he said. "Let us take the 'K' out of the Engineering Block and become a real member of the political Bloc family, so that we can oppose aggressive assertion of selfish interests, with sound economic reasoning and unselfish purpose. Running a republic takes a lot of talking and it is a pity that a large and influential thinking class would sooner wear a muzzle than assume its proper position in the chorus."

Pretty sound advice.

Many Big Ideas Born In One Little Building

UP in Syracuse, at 208 South Geddes Street, there is a 2-story brick building which has been the birthplace of a surprisingly large number of important inventions. The Engelberg coffee and rice huller was worked out there and the bi-gear for

More or Less Pertinent Comment on Topics of Current Interest to Men in the Industry

bicycles, the Denison typewriter, the Hawley time recorder, the first mutascope, the camera known as the biograph, and the Lipe broom and cigar machines. John Wilkinson's early experimental work was done there while H. H. Franklin was making die castings and Rodman Reed's drawings for the first Franklin car were made in it. The Brown-Lipe gear chamfering machine and A. T. Brown's tractor mower also were developed in the building. Henry Ford built parts of his first automobile in the shop, supervising the work himself. The Brown-Lipe differential gearing machine was made there, too. C. E. Lipe developed most of his brain children in the little brick structure but he did not live to reap the financial profits his ideas ultimately won. Dozens of other patents are credited to men who worked out their ideas in the old building, and Syracuse could well afford to preserve it as a monument to the mechanical genius of the men who have made the city an industrial center.

New York's Bus Plans Excite Truck Makers

PROSPECTIVE enactment by the New York State Legislature of a statute which would permit the City of New York to bond itself for $25,000,000 for the purchase of buses to supplant traction lines is causing considerable palpitation in the motor truck plants of the country. Almost every company is watching the situation closely, determined to get a part of the business if possible. The New York Board of Estimate is said to have worked out a very definite program in expectation of favorable action by the Legislature. This includes the scrapping of a good many miles of surface lines. It is greatly to be hoped that if the municipality does embark upon this gigantic bus venture it can be kept free from politics from the moment bids are asked. It also is to be hoped that the Hylan administration will not call upon buses to perform tasks which will be impossible at this stage of their development.

Dr. Rosenhain Enjoys Skidding in the Snow

DR. WALTER ROSENHAIN, the celebrated British metallurgist who is in this country to deliver several lectures on technical subjects, never was in the United States in the winter before and he is much interested in the snow with which we have been blessed. The day after his arrival in New York he had the chauffeur of a relative, whose guest he was, drive him up to Central Park. Once there he had the driver take him into some of the open places where there was a trackless waste. Then he enjoyed the novel experience of skidding around in the snow. He doesn't mind how cold it gets, but he contends that temperatures in American homes and buildings "are 15 or 20 degrees too high."

Foreign Markets Crying For Battery Service

IN connection with the formation of the foreign trade committee of the Motor and Accessory Manufacturers' Association, it is pointed out that distributors and service station operators in other countries are finding it extremely difficult to purchase American made service equipment. This, it is claimed, is particularly true in regard to such equipment as is used in the battery and electrical shops. In other words, the American manufacturers of this class of material, with few exceptions, have made practically no effort to place their products in the overseas markets. The distributors and dealers, in purchasing equipment of this sort, generally are forced to have some one here buy it for them, this being done by other companies from which they buy cars, trucks or accessories. The M. & A. M. A. committee perhaps can take steps to correct this condition but it would seem that such organizations as the Automotive Electric Association, the Automotive Equipment Association and the individual manufacturers of all classes of service machinery have an obligation to give some consideration to the industry as it is being built around the American automobile in other lands.

Durant Tells "Partners" What He Thinks of Raid

W. C. DURANT has not paid much attention to the recent raids on his securities on the curb market but in a special number of the *Durant Partner*, which goes to all investors in his securities, he says:

"A raid has been made upon our securities. Propaganda has been started by envious competitors and disgruntled bankers. We are accused of selling goods at less than cost and credited with expanding our business too rapidly. The whole idea is to embarrass us, if possible; to check our development and give a clearer field to the interests who are seeking to control this great industry."

Durant makes the prediction that he will have 500,000 partners, or stockholders, by Dec. 31, next. The number was 249,377 on Feb. 15.

J. D.

Federal Experiments with Chassis Designed for Bus Service

New product now under test may later be put in production. Average frame height 25 in. Continental engine and Timken axle with underslung worm employed. Gearset has overdrive and wheels are of the demountable cast steel disk type.

A NEW bus design with seating capacity for twenty-nine passengers and driver, and with an average frame height of but 25 in. from the ground, has just been developed experimentally by the Federal Motor Truck Co. The chassis was designed for either city or country use. It is distinctly a bus chassis differing radically from the truck chassis made by the same company, particularly in the efforts made to bring the body close to the ground. Even the floor boards over the bow in the rear axle have been cut away and a thin steel plate substituted with a resulting gain of ¾ in. The frame is special from one end to the other, with a kick-up at the rear end and a bottle-neck construction at the front. The springs are underslung.

Experimental Federal bus with frame 25 in. from ground. It is designed to seat 29 passengers

It is not known yet whether the bus will be put into production. It was developed by the Federal company as typical of specialized bus practice. The bus has been built up as designed, and has been on experimental runs with encouraging success. So far, however, only one bus of this design has been built.

About the only major part of the chassis that falls in line with standard Federal practice is the engine which is a Continental L-4. This is the 4½ by 5½ in. unit used in the large capacity Federal truck. The 14 in. Borg & Beck clutch has a capacity considerably in excess of the engine torque in order to care for the extremely severe conditions of frequent starting and stopping encountered in city bus work.

The gearset is specially designed for this particular chassis. It was developed for the purpose by the Detroit Gear and Machine Co., and incorporates an overdrive with a ratio of .74 to 1. The gearset shafts are mounted on annular bearings with the exception of the journal bearing on the front end of the main shaft, which is a Hyatt roller type. The gearset unit and the engine are separately mounted and both are suspended at three points. There is a universal between the clutch and the gearset and another between the gearset and the rear axle.

The rear axle is a Timken with an inverted worm drive. This also is special, although made from a combination of parts used in two other designs, the Timken rear No. 6560 carrier mechanism with a special housing to accommodate the extra wide rear track, and the brakes of Timken rear No. 6666. These brakes are of 21 in. diameter, with 3¾ in. face. The drums are cast steel with integral cooling fins. Designed with a large oversize factor and with particular attention to heat dissipation, the object has been to care for the abnormal demands on brakes which are apt to occur through continuous work in city traffic.

The wheels are special. They are demountable, cast steel disks. They can be removed without disturbing the bearings or the bearing adjustments. With this provision there is no occasion to alter the bearing adjustment when the wheel is removed to make a change in tires. This takes the bearing adjustment duty out of hands where it does not belong and, furthermore, reduces the opportunity for getting dirt into the bearings. Experience has shown that considerable time can be saved by the elimination of bearing adjustment every time a tire is changed. On a large fleet of buses, one or more are tied up per day for tire changes. It takes an expert mechanic to adjust the wheel bearings properly, and if the need for such adjustment can be eliminated the saving is obvious.

The front axle is a reversed Elliott type. This has been chosen because it helps in lowering the suspension. It provides a large drop between the wheel spindle and the spring pad without bad offsets in the steering arm or cross tube. It also gives a simple beam forging. With a wide track combined with the narrow front frame it is possible to cut the front wheels in steering to an angle of

47 deg. either left or right. The frame tapers down to 38 in. width in the front and is 56 in. wide in the rear. The track is 68 in. front and 74 in. rear.

To provide a straight line drive to the underneath worm, the engine is set in the chassis at an angle of 2 deg. 18 min. No ill effect as far as oiling is concerned has been found to result from this, the engine being full pressure fed even to the wristpins. The frame is kicked up over the rear axle to keep it low. The road clearance is 7 in, the low point being the rear axle housing under the worm. In order that the wheel housing shall not cut unduly into the body space there is a double step instead of single, the upper step or indentation in the body gives clearance for the upper extremity of the wheel and the lower indentation gives clearance for the brake drum. As a result there is no loss in seating capacity even with the low frame.

Tires are Goodrich semi-pneumatic, 34 by 4 in. front and 34 by 4 in. dual rear. Spring suspension is conventional semi-elliptic, progressive type, with free leaves which are picked up under severe deflection, but which do not come into action with minor deflection. The shackle pins are 1 in. diameter front and 1⅜ in. rear. The chassis is lubricated by the Alemite system.

The body shown in the cut is a type designed for this chassis by the C. R. Wilson Co., and is suitable for city or country work. It has a center aisle with two-passenger seats to the left and right, and a continuous seat across the rear.

The body as well as the chassis is experimental, as stated, but the entire design is being studied for production, and may find its way to the market in the near future.

Advisory Board Suggests Research Activities

IN the following outline W. K. Hatt, Director Advisory Board on Highway Research, National Research Council, suggests topics of research which might best be taken up by the various parts of the automotive industry:

A. Research for Automotive Engineer:

1. By laboratory tests to determine:
   (a) Fuel, oil and grease consumption and power development of vehicle and from these to calculate the performance on various surfaces and grades, and the excess power for moving trailers. See Bull. of Michigan State Highway Department on Experiments by Professor Lay.
   (b) To study the effect of improved grades on the design of the power plant of the vehicle.
   (c) To consider the design of the vehicle in order to impose on the road the minimum loads for specified capacity of vehicle.
   (d) To study the lighting system of autos with a view to safety, and the mechanisms indicating intentions of the driver.

B. Research for Highway Engineers:

1. To find rolling and air resistance of motor vehicles at various loadings and speeds on types of road surfaces and curves; limit of adhesion.
2. To determine the loads imposed on road surfaces by various vehicles, with various tire equipment at various speeds.
3. To discover the stresses and strains acting in various road surfacings under the expected loads, and the properties and improvement of subsoils.
4. To determine capital and maintenance costs resident in the road.
5. To determine the laws governing the increase of highway traffic by basic surveys of flow of traffic in typical regions.

C. Research for N. A. C. C. and Auto Associations:

1. To assign schedule cards to a selected group of, say, 200 passenger drivers for each condition, to obtain operating expenses on the average for:
   (a) Three classes of cars;
   (b) Regional conditions,
   Macadam and gravel roads,
   Dirt roads,
   Paved roads;
   (c) Topography,
   Level,
   Hilly.
2. To study records of truck and passenger bus fleets to obtain similar data.

D. Locating Highway Engineer:

Given road resistance, power available at wheels, speeds, fuel, oil, and grease consumption, tires, repairs, driver's time, depreciation, overhead, expected traffic.
To find relation between capital costs of construction and operating expenses on roads of various surface and grades (length and rate).

E. Federal Agencies:

1. To study movements of commodities and passengers by highway and railway in the interest of co-ordination of transport.
2. To study the financing of highway improvements in the light of experience and science in related fields of financing of public improvements.
3. To study the effect of highway improvements on regional industries.
4. To study the effect of highway improvements upon general productivity of men and industries.

F. Advisory Board on Highway Research:

To evaluate progress in the several fields of highway research by an analysis of completed and current projects; to outline needed researches, and to assist existing organizations to correlate their work in the light of a comprehensive program, and to publish bulletins of information on methods and technique of research and on progress in the several fields.

Jan. 1, 1923.

ALTHOUGH since the war attempts have been made to repair the damage caused by the transport of artillery and the frequent passage of heavy trucks, nevertheless, much remains to be done in order to fit the main roads of France for modern traffic. This fact has been acknowledged by the Chamber of Deputies, which has now passed a bill by which large numbers of main roads are to be relaid.

The bill applies both to departmental and national roadways, and provides for the relaying, with all modern improvements, of 4700 miles of national roadways and a similar distance of departmental roads.

A State subsidy will be granted to the departmental authorities for the latter class. Not only the industrial importance of a route, but also its interest from the tourist's point of view has been studied in making a selection of the roadways to be relaid.

Torbensen Passenger Car Axles Have Numerous Refinements in Design

Rear axle is a semi-floating banjo type with pressed steel housing. Bevel pinion has outboard bearing and is given permanent factory adjustment. Expanding band used on internal brake. Elliott type front axle said to have dust-proof parts.

AS recently announced in these columns, The Torbensen Axle Co. is now preparing to market front and rear axles for passenger cars of about 3000 lb. weight.

The rear axle is a semi-floating banjo type, with a housing of pressed steel, reinforced with tubing. The bevel gears are of the helical type and are made from nickel steel forgings. The carrier for the pinion shaft is unusual in that the bevel pinion is carried between the two bearings instead of being overhung as in most conventional type axles. Both of the pinion shaft bearings are of the radial ball type, the one nearest the differential being a single row bearing and the other a double row type designed to take both thrusts and radial load. Tapered roller bearings are used each side of the differential and in the wheels.

The live axles have large splines at their inner end and are provided with the usual taper key and nut for hub attachment. The shafts are of molybdenum steel.

The rear axles are fitted with two sets of brakes acting respectively on the inside and outside of drums which measure 14½ in. outside diameter. The internal brakes are 1¾ in. wide and are actuated by a cam. The linings in this case are carried on an expanding band instead of hinged shoes, as will be seen by reference to the drawing. The action of the internal brakes is substantially the reverse of that of the external pair, which are of the contracting type, actuated by a conventional toggle linkage. The two brake shafts are concentrically mounted. The outer shaft or tube actuates the contracting brakes and the inner shaft carries the cam for the expanding brake.

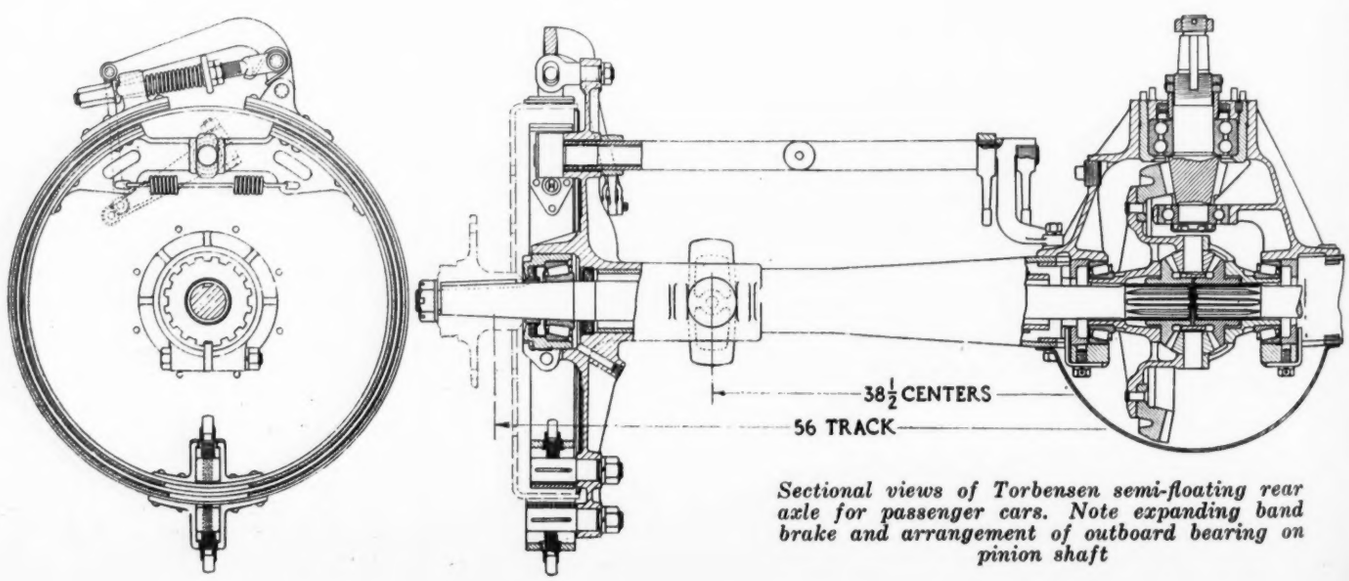
End fittings are in the form of a single casting which includes the brake anchorage, brake shaft support and spring seat.

The rear axle is said to weigh 300 lb. with hubs and brake drums. It has a road clearance of 9 5/16 in. when used with 32-in. wheels. Its maximum load carrying capacity is 1900 lb. All oil inclosures are of leather, backed by felt or cork.

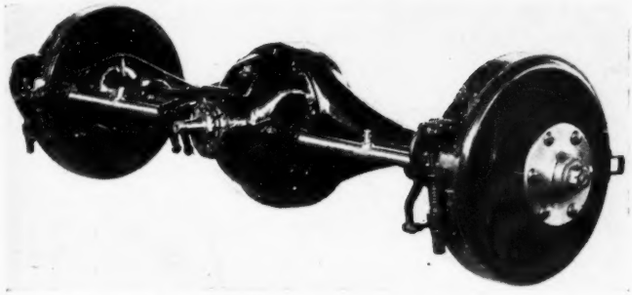
The initial or factory adjustment on the pinion shaft is said to be the only one required in view of the large size bearings employed and their consequent long life.

The brakes are readily adjusted by small increments turning a single self-locking nut on each of the toggle links.

The front axle is quite conventional in most particulars. The axle center is of No. 1040 S. A. E. steel having the usual I-beam section. The knuckles are of molybdenum steel and are carried in yokes of the Elliott type. All knuckle arms are of chrome nickel steel and are fitted with balls arranged to fit into sockets in the end of the tie-rod and draglink respectively. The sockets at the end of the tubular tie-rod are fitted with a metal cover having a spring retained felt packing designed to prevent the entrance of dust and moisture.



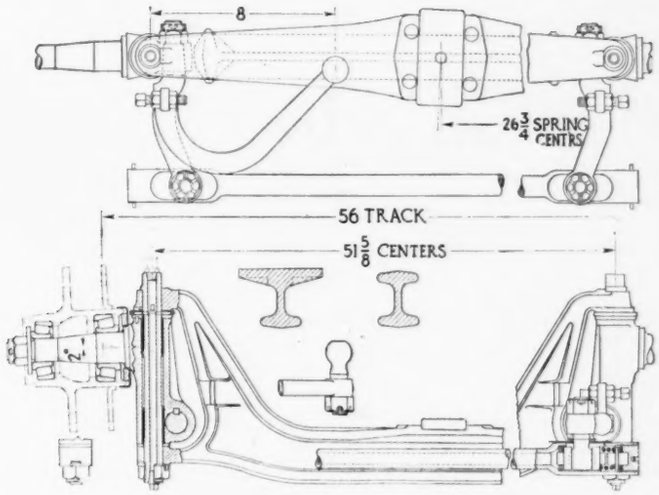
Sectional views of Torbensen semi-floating rear axle for passenger cars. Note expanding band brake and arrangement of outboard bearing on pinion shaft



External view of Torbensen passenger car rear axle. Note banjo type of pressed steel housing and concentric arrangement of brake shafts

The knuckle pivot pin is drilled to provide a reservoir for lubricant from which the flanged thrust bearing and pin bushings are supplied with oil or grease. The thrust washers are of bronze, and form in themselves shallow cups which hold a small amount of lubricant.

The king pins are threaded at their lower ends and the central holes are closed at the bottom by pipe plugs. Special locking washers are inserted between the lower nuts and the jaws of the axle forging. The king pin bushings are pressed into the knuckle and are burnished to give a good bearing surface on the pin. All wearing surfaces are said to be dustproof and no soft washers are used either for load carrying or for spacing purposes. The lubricant employed can be either oil or grease.



Torbensen Elliott type front axle has ball and socket connections on tie-rod

The front axle has a maximum carrying capacity of 1600 lb. and a road clearance of 10 3/16 in. at the center when 32-in. wheels are employed.

New Cushion Tire Has Pneumatic Core

HIGHER speed operation of trucks, which has been demanded for some time in the commercial vehicle field, is being met by the wider use of pneumatic and cushion type of tires. A recent contribution of the tire industry in this direction is the production by the Kelly-Springfield Tire Co. of a new cushion truck tire, bearing the trade name "Aircore." This tire is quite similar in external appearance to the so-called "caterpillar" tire, which has been manufactured for some time by the same company. It differs from the caterpillar in that it has an annular hollow or air space of approximately triangular section running around the entire circumference of the inner portion of the tire, as will be noted from the accompanying section drawing, Fig. 1.

The walls of the tread have transverse notches which extend from each side of a point beyond the center and are staggered alternately right and left. The hollow core and the notches furnish displacement spaces into which the rubber can flow as the tire is compressed in passing between the road and the wheel. The notches also provide better traction, especially under adverse road conditions. As will be seen from the photograph of the tread, the notches are provided with pebble ejectors in the form of step-like rubber lugs, which prevent the accumulation of caked mud or stones in the notches.

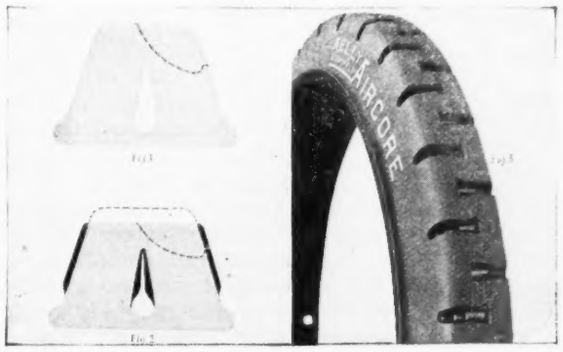


Fig. 1—Sectional view of the Kelly-Springfield Aircore tire under no load. Fig. 2—Section of the same tire showing how rubber is displaced when the tire is compressed. Fig. 3—External view of Aircore tire showing the tread with staggered notches and pebble ejectors

When the tire section is compressed, it is said to assume the shape shown in Fig. 2 of the accompanying cut. It will be noted that the triangular air core space has well rounded corners and is given a so-called spear head-shape in order that the rubber, when displaced, shall not cause any severe bend at any portion of the core or side walls. The tire is especially designed to prevent acute bending of the side walls, which, if it occurred, would tend to produce the same character of failure which occurs from the use of an under inflated pneumatic tire.

A further advantage of the shape of core employed is claimed to be the more rapid recovery of the rubber to its normal shape, following deflection. On account of this action the tire is said to remain more resilient at high speed than it would otherwise be.

According to the manufacturers, tests made by the United States Bureau of Public Roads indicates that the tire has a resiliency within 8 per cent of that of pneumatic tires and that the force of the impact blow which the tire strikes an uneven road surface is only half that of a solid tire, operated under the same conditions.

The Aircore tire is intended for service on front wheels of all trucks except the heaviest and for rear wheel service on trucks requiring resiliency and high speed ability. It is to be made in sizes ranging from 34 x 4 to 40 x 8 and 36 x 10. Although the prices of the Aircore tire are somewhat higher than those of the solid and Caterpillar tires of the same makes, they are considerably less than those of pneumatic truck tires of the same capacity.

Can More Flexible Front Springs Be Successfully Used?

One method, here suggested, is to use double transverse springs arranged to take the place of the usual type of front axle. Novel layout of steering linkage proposed to avoid wheel wobble likely to occur with other flexible spring design.

By George L. McCain

FRONT springs and steering systems of present day cars are arranged to give reasonable service and dependability but, as is the case with other parts of the car, involve numerous compromises, many of which are unavoidable in any feasible design.

With semi-elliptic springs and the steering linkage widely used, it is necessary to reduce to a minimum the vertical movement of the front axle, because the greater this movement, the greater will be the wobble of the front wheels when traversing rough roads. The second limitation or compromise is in respect to road clearance, and against this is the desire to lower the frame, so that low, sweeping lines can be carried out in the design of the body. Consequently, the construction usually employed involves:

1—A relatively stiff front spring.

2—A steering arrangement that is not entirely satisfactory.

3—A weakening of the frame directly above the axle, due to the use of minimum depth of frame at that point.

A modification of one of the above three points would affect one or both of the others. It is likewise true that a more flexible front spring would be desirable from the standpoint of the passenger and also the chassis mechanism, as road shocks would be absorbed in the springs. In other words, if a more flexible front spring can be used, a perfect steering linkage arranged, and the frame designed without the usual compromise, a more satisfactory automobile will result.

ROADS in general have two kinds of bumps, or irregularities; short, abrupt ones, and long rolls or humps. The short one usually causes a very uncomfortable jolt on the front seat and a comparatively light reaction on the rear, while the long roll has a minimum effect on the front and a maximum on the rear. The body or mass of the car tends to move as a whole, and since the front springs are comparatively rigid, the shock is absorbed chiefly by the rear springs. If the front and rear springs were made to have nearly the same unit deflection, a larger portion of such shock would be absorbed by the front springs. To have the same flexibility in both front and rear springs might result in teetering, but a slight variation in their respective characteristics tends to prevent this fault.

There are doubtless various ways of obtaining flexibility of the front springs, and at the same time overcoming the limitations mentioned.

To place long, flexible springs longitudinally under the frame involves a large movement of the axle and steering linkage. If, however, the springs be mounted transversely one above the other on a rigid seat at the center and the steering knuckles be mounted directly on the ends of the springs, any vertical motion will cause a shortening of the front wheel tread, but by an amount which is comparatively negligible, since the movement of the eyes is (approximately) on a long radius about the central mounting. To obtain proper steering with this arrangement, it is necessary to place the steering lever in the center and to use a divided, or articulated, tie rod.

With such an arrangement, the lever, which is mounted on the central spring anchorage, becomes a part of the chassis proper and does not move with the wheels and springs. With this construction it is also possible to eliminate the I-beam axle and materially reduce the unsprung weight with consequent advantages. In fact, the unsprung

FRONT springs usually are shorter and stiffer than those commonly employed on the rear of passenger cars. This is due partly to the fact that more flexible springs, giving a greater deflection for the same load, are apt to interfere with steering or result in wheel wobble, although such springs would, if used, give better riding qualities in most cases.

The author of this paper, in seeking a construction which would be a better compromise than that involved in the conventional type has prepared the design which he here describes and of which he cites the advantages. Whether or not there are corresponding disadvantages is not stated. In any case promising solutions of the problem of securing better riding cars are worthy of careful study. We shall welcome for use in the Forum concise statements expressing the views of engineers qualified to contribute to the solution of this important problem.

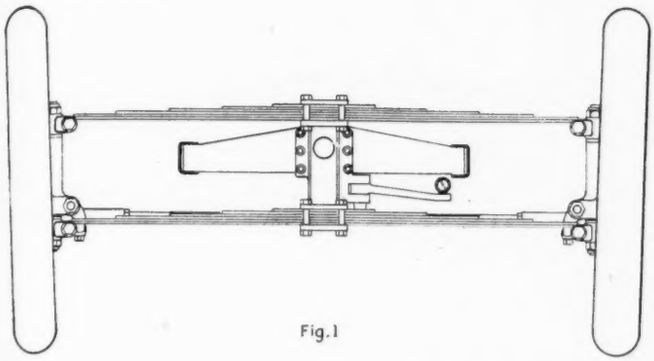


Fig.1

Spring layout and tie rod connections suggested by author

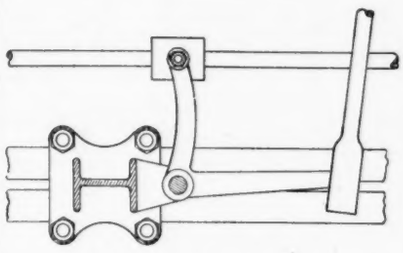


Fig.2

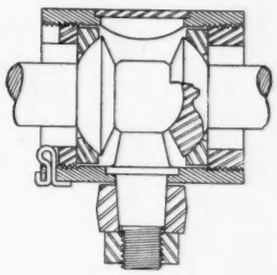


Fig.3

weight of such an arrangement is that of the wheels and tires, steering knuckles, king pins, and bearings, and about one-third the weight of the springs and the cross tubes, or tie rod. Further, no matter what vertical position the wheels may assume in relation to the body, they will remain substantially parallel.

Fig. 1 shows the arrangement of front springs as described above, and Fig. 2 the arrangement of the steering lever bell crank and tie rod. Fig. 3 shows the arrangement of the double ball joints, which permit of movement of the cross tube ends in any direction and through a sufficient angle to allow of any possible movement.

Several experimental cars have been built with this spring construction and steering approximately as shown, and the results have been highly satisfactory. The rear springs were designed with a deflection of 110 lb. per in., or a total of 220 lb. per in. for the rear end, while the front springs had a deflection of about 60 lb. per in., or 240 lb. per in. for the front end. It will be noted that the deflection rate is about the same, front and rear, which does allow of some teetering or pitching under unusual conditions, but makes, nevertheless, a very comfortable riding car, in either front or rear seat. The pitching has been effectively stopped by the use of shock absorbers.

With the average car of today the ratio of sprung weight to unsprung weight (car loaded) is approximately seven to one (front end), and with the car having the transverse construction herein described, is about ten to one. This alone would improve the riding qualities of the car, even though other changes had not been included in the construction.

The design above described improves not only the riding comfort and steering, by correcting the tendency to wheel wobble, but facilitates steering as well. Because of the greater flexibility of the front end, the road shocks, which are usually transmitted to the steering wheel, are absorbed in the springs, and steering of the car involves little effort, even over the roughest of roads.

Development along this line will undoubtedly demonstrate other facts beyond those above outlined. The limited data contained herein is intended only as a report of progress in a certain direction.

Sales Possibilities Increased by Colorado River Project

By M. H. Hoepli, Acting Chief, Automotive Division

ONE of the projects that is just now attracting considerable attention among automobile manufacturers who are endeavoring to still further widen their domestic market is the development of the Colorado River basin, which has come within the reach of realization through the signing of the Colorado River compact on Nov. 24, 1922.

The significance of the ratification of this compact is evident from the fact that it makes possible the development of 242,000 sq. miles, a territory larger than the Republic of France. Through irrigation and cultivation 4,000,000 acres of land, now desert, can be converted into farm land. Six million horsepower, now waste waters, can be created thus stimulating industrial enterprise. Not less than 3,000,000 American citizens, including ex-service men and women, will be able to build new homes and thus lay the foundation for new purchasing power and new wealth.

To the automobile manufacturer analyzing the project from his particular angle this will ultimately mean a potential market of between 300,000 and 400,000 cars and trucks—assuming that the majority of the prospective settlers are not car owners as yet and that their increased purchasing power derived from the virgin soil, coupled with the actual need for transportation, will induce them to buy motor vehicles. Considering that the reclaimed area may some day be inhabited by as many as 3,000,000 people, this would mean at the rate of cars prevailing in the States of which this territory is made up more than 300,000 new vehicles. On the other hand, considering that Texas has an area slightly in excess of the land embraced by the reclamation project and had in 1921 a motor vehicle population of 467,616, another estimate would be in the neighborhood of 400,000 cars.

The importance of the project from a purely automotive standpoint—not even considering the allied products, such as parts, accessories, garage equipment—is self-evident. This is merely another instance bearing out the fact that for the motor vehicle manufacturer the domestic market has still tremendous possibilities for future development. And applying this same reasoning to other industries, the vastness of our yet undeveloped resources deserves once more to be brought before the eyes of the public.

DURING the year 1922, the Paris air port at Le Bourget received or sent away 4812 aerial liners carrying 19,972 passengers, 1021 tons of freight, and 7600 lb. of mail. Flying was suspended on 35 days owing to weather conditions. Comparative figures for the last three years are as follows:

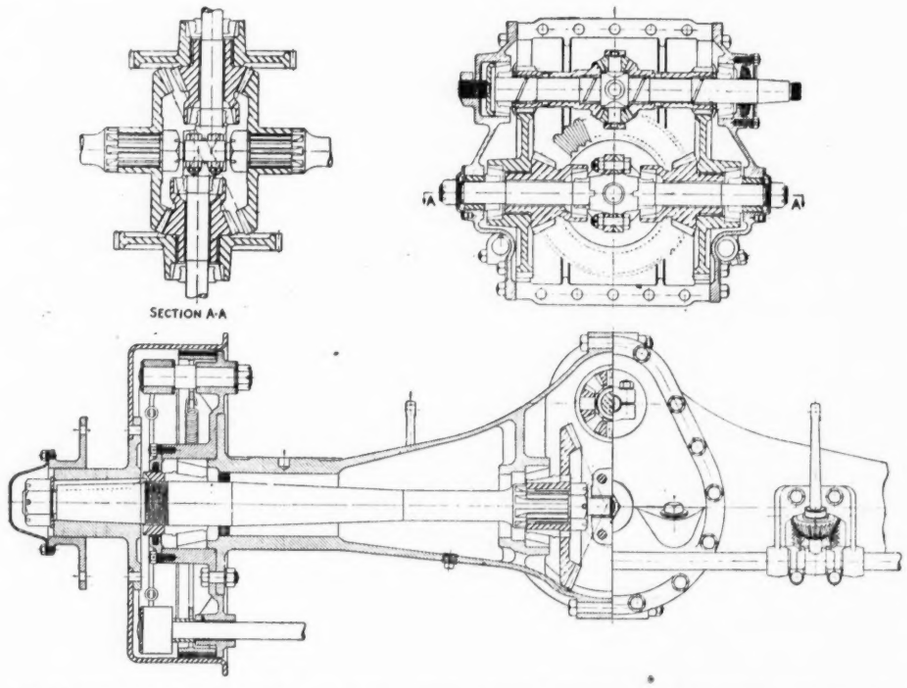
	1920	1921	1922
Number of planes	3,359	4,206	4,812
Passengers	10,215	18,166	19,972
Freight, pounds	266,182	330,690	1,021,331
Mail, pounds	3,246	7,310	7,592

Triple Reduction Features New 5-Ton L M Truck Axle

Is said to be more compact than one of double reduction type with same ratio. Differential placed on highest speed shaft where stresses are lowest. First and third reductions by spur gears, second by bevels. New double reduction also being built.

A NEW triple-reduction truck axle incorporating many of the same features which have characterized the double-reduction axles manufactured by the L M Axle Co. since 1919 is now being produced by the same company whose line includes also a new double-reduction type.

Among the features of the latest designs may be mentioned the use of differentials on the primary instead of on the final drive shaft, as in conventional practice, the mounting of all but the final drive gears on a carrier plate so that they can be removed as a single unit, and the use of careful heat treatment on all important parts.



L M two-ton double reduction axle. Note arrangement of differential and use of a bevel pinion and sectors to actuate and equalize the brakes

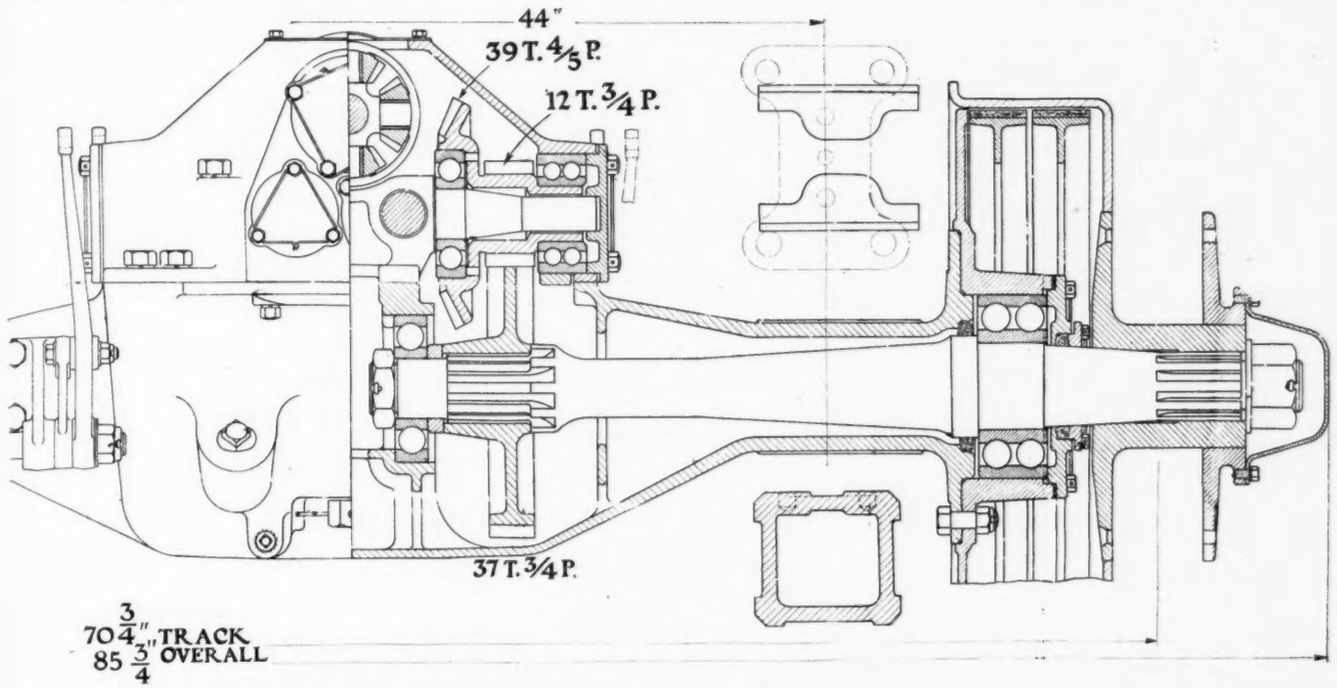
Although a gear reduction of 11.28 to 1 is obtained by the three sets of gears in the triple-reduction, five-ton type, a mechanical efficiency of 96 per cent under low gear conditions is said to be attained. This is attributable, in part at least, to the use of ball bearings on all shafts.

The primary reason for using triple as against double reduction is said to be the fact that a more compact design is thus made possible. Placing the differential on the highest speed instead of on the lowest speed shaft minimizes the stresses to which it is subjected and thus permits of a lighter construction than would otherwise be required in this part.

Referring to the drawing of the triple reduction type it will be seen that the differential shaft is mounted in an annular ball bearing at either end. The shaft bearings take only the stresses incident to the whipping of the propeller shaft. The side gear of the differential and the pinions for the first reduction are integral and are carried on a separate bearing mounted in the carrier housing. These bearings take the radial load due to the tooth pressure on the spur pinion and also the thrust load, which may be developed by the differential.

The first reduction is through spur gears and takes place between the differential shaft, which is, of course, mounted fore and aft and two first intermediate shafts, which are located below and are parallel to the differential shaft and at each side of it. The first intermediate shafts carry, in addition to the spur gears, bevel pinions, which are splined onto the shafts. The bevel pinions on these shafts mesh with bevel ring gears, which are mounted on transverse shafts parallel to the live axles. These transverse shafts are stationary and are so constructed that the first intermediate shafts are free to rotate through two holes which are placed in the transverse shaft. The bevel ring gears on the transverse shafts are made integral with spur pinions cut on their hubs. These bevel ring gear and pinion units are mounted on annular ball bearings, the outer ones being of the double row type designed to take thrust as well as radial load. The third reduction is between the spur pinions integral with the bevel gears and large spur gears mounted on each of the axle shafts. The axle shafts are splined to take the large spur gears and the inner ends of the shafts are mounted on a No. 413 annular bearing, while the outer end is mounted on a No. 319 double row bearing.

All but one of the gears are made from No. 3120 S. A.



L M five-ton triple-reduction axle. Note location of differential on highest speed shaft at the top. All gears except those splined to the inner ends of the live axles are assembled as a separate unit on a carrier which is readily removed for inspection or service

E. steel and are pack-hardened, allowed to cool off in the pots and then given a double quench and draw. Both bevel pinions are made out of S. A. E. No. 2512, 5 per cent nickel steel and are pack-hardened and given the same treatment. The steel in the axle shafts is No. 3240 S. A. E., made in an acid furnace. These shafts are given a double heat-treatment and quenched and a minimum elastic limit of 130,000 lb. is obtained. A Brinell hardness of 311 to 344 is allowed, with a hardness of 320 desired. Laboratory tests conducted on this axle are said to have shown an efficiency of 96 per cent under low gear conditions during a continuous run of eight hours.

All of the gears, except the final drive gears, are mounted in a carrier which bolts onto the top of the housing in a manner similar to the conventional worm drive axle. This carrier may be removed in exactly the same way as in a worm drive and the gear set is then open for inspection and service. The weight of the axle is said to be about the same as that of conventional worm gear axles of the same capacity.

The brakes are of the internal expanding type, operated by cams and mounted side by side. The diameter of the brakes is 24 in. and the face 2½ in. The hubs are mounted on the ends of the axle shafts by means of a taper in connection with a spline.

The two-ton axle is constructed along the same general lines as the five-ton, with the exception that the necessary reduction is obtained in two reductions instead of three.

The differential is located on a fore and aft shaft at the top of the housing and revolves at propeller shaft speed; at either side of the differential, a spur pinion meshes with a gear on an intermediate shaft. This constitutes the first reduction. Bevel pinions on the intermediate shaft attached to the spur gears in turn mesh with ring gears which are splined onto the axle shafts, making the second reduction.

There are two intermediate shafts which allows a separate train of gears for each axle shaft.

The location of differential is such that it is only subject to very light strains and all of the reduction takes place after the power has been passed through the differential.

The material and heat-treatment of parts is the same for this axle as that given to corresponding parts of the five-ton, as outlined above.

Both of the axles described above are of the semi-floating type and both have cast housings, the larger of the two having a square or box section between central and end portions, and the smaller having circular or tubular section. A bevel pinion and sector device is used for the purpose of actuating and of equalizing the brakes.

Swiss Automotive Imports Decrease

THE imports of automobiles into Switzerland during the first nine months of 1922 amounted in value to 19,603,000 francs, as against 33,191,000 francs during the same period of the preceding year, or a decrease of 13,588,000 francs.

The exports of Swiss-made automobiles during the first nine months of 1922 amounted to 2,638,000 francs, as compared with 4,555,000 francs in the same period of 1921, a decrease of 1,917,000 francs.

As to the imports, the largest value of cars came from France (5,640,000 francs), Italy (4,413,000), Germany (3,301,000) and United States (3,057,000 francs). Great Britain supplied 1,138,000 francs worth of cars, and the rest came from Austria, Belgium, Holland and one car from Poland, the price of which was 15,000 francs.

The largest buyer of Swiss cars was Rumania, a country which up to the outbreak of the war scarcely bought a Swiss-made automobile. In this connection it may be stated that the manufacture of passenger cars has almost been given up in Switzerland.

An Analytical Study of Crank-Pin Bearing Design and Lubrication

Part I

Rigidity a factor of prime importance. Without it the ill effects of uneven loading cannot be minimized. Polar diagrams used to determine magnitude and direction of bearing loads. Load and speed control size of bearings.

By G. D. Angle
In charge Airplane Engine Design, McCook's Field

THE chief endeavor in airplane engine development since the war has been to obtain greater durability. Experience has been gained by improving the most promising of existing designs, which already fulfilled the majority of service requirements, rather than by designing new engines of similar types with only minor improvements in view. Other desired characteristics, such as light weight per horsepower, compactness, accessibility, etc., are not always sacrificed in the course of such development, as it is mainly a matter of analyzing existing difficulties and devising means for overcoming them. Durable engines are for the most part reliable, and they also cost less to maintain.

Pitting, cracking, excessive wear, and the occasional flowing of the white metal in crank-pin bearings are troubles experienced with airplane engines of practically every type. In a well-made bearing of suitable material that is supplied with a lubricant of an approved specification, the trouble must be attributed to either distortion, excessive loading or ineffective means of introducing the oil. Engines having carefully designed bearings should not have to be torn down and overhauled on account of failures of this kind unless lubrication failure occurs.

In this article it is intended to analyze briefly some of the most important phases of crank-pin bearing design, in the hope that it will suggest means for improving bearings that are not giving satisfactory service, and will also serve as a guide in laying down new designs. The material contained herein is in the main original, although it is believed that the method of plotting polar diagrams for the study of bearing loads was first suggested by Otto Burkhart of the Pierce-Arrow Motor Car Co. The author has long employed these methods for analyzing bearing design problems, with results that have been quite satisfactory, and their practical value will be appreciated by the fact that they have been confirmed by tests and service conditions on a number of different airplane engines.

Rigidity

The first requisite of crank-pin bearing design is to provide the necessary rigidity. This is a fundamental requirement, as the bad effects of uneven loading are rarely reduced by merely improving lubrication or designing for lighter loads. However, with some forms of connecting rod construction it is difficult to maintain even loading; consequently, the deflection of the rod sections adjacent to the bearing shell should first be analyzed and the section strengthened wherever it seems necessary. The bearing shell is usually made of bronze of a comparatively low modulus of elasticity and cannot be stiffened as easily as the connecting rod.

The problem of connecting rod deflection is confined almost entirely to the forked type. Articulated connecting rods rarely show evidence of localized loading due to distortion, as the bearing shell is fully supported in the large end of the master rod.

Although the bearing shell is fully supported circumferentially in the plain-type connecting rod, localized loading sometimes has been observed on the bearing directly underneath the weakest section, which is generally at a point about midway between the bolt boss and the shank of the rod. This is frequently traceable to loosely fitted cap bolts, and in order to provide for extreme conditions in all types of rod, it is best to compute the stresses in the cap and rod as if the two were functioning independently of each other.

Referring to Fig. 1, let us assume that a force applied to the rod is producing a bending stress in section *A* as in a cantilever beam, the value of this force being obtained from a polar diagram of forces constructed with respect to the connecting-rod axis. The section *A* is one having the smallest cross sectional area, and *F* is the maximum component force parallel with it, chosen to give the greatest possible length of lever arm. Stresses computed in this manner are, of course much higher than would be produced under actual running conditions, due to the restraining effect of the cap-bolts; nevertheless the stress values seem to indicate the degree of deflection which occurs, and sections having a factor of safety less than 1.5 are not to be recommended. The

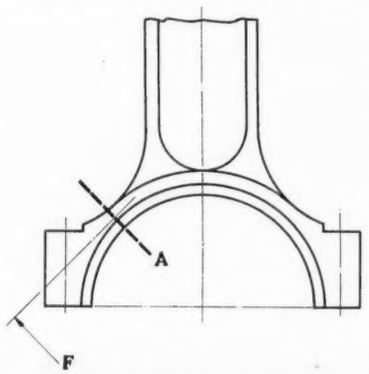


Fig. 1—Diagram of the load causing distortion in the connecting rod

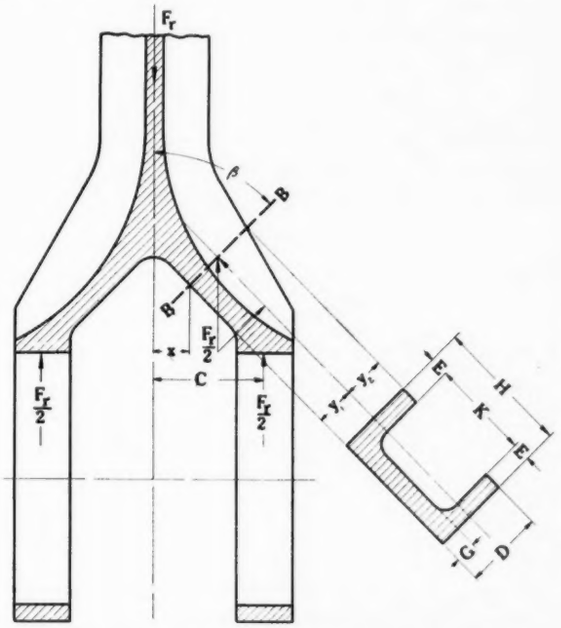


Fig. 2—Diagram of loads for the study of deflections in the forked connecting rod

above method may be applied to any type of rod employing a detachable cap.

Consider next the forked-type rod in the plane of the crank-pin axis as shown in Fig. 2. Forces along the axis of the connecting rod cause combined compressive and bending stresses in every cross section of the fork; the bending stresses predominating in this case, as the forks are considered free to deflect endwise. As in the preceding case, the calculated stresses will be much greater than the actual, and same factor of safety should be allowed.

Any cross section of the fork—such as *BB*—will be subjected to a compressive force P_c, and a bending moment M_b.

$$(1) \quad P_c = \frac{F_r}{2} \sin \beta \text{ and}$$

$$(2) \quad M_b = \frac{F_r}{2} (C - x - y_1 \sin \beta)$$

The combined stress of bending and compression is maximum at the outer edge of the fork and can be computed by means of the following equation:

$$(3) \quad S = \frac{F_r}{2} \left[\frac{\sin \beta}{A} + \frac{y_2}{I_x} (C - x - y_1 \sin \beta) \right]$$

where

S = maximum combined stress.
F_r = compressive force along connecting-rod axis
A = area of cross section.
β = angle of cross section to C. L. of rod.
C = distance of center of fork bearing to C. L. of rod.
x = distance of inner edge of section to C. L. of rod.
y_1 = distance of C. G. of section to inner edge.
y_2 = distance of C. G. of section to outer edge.
I_x = moment of inertia of section about gravity axis.

Equations for some of the above symbols are as follows:

$$(4) \quad A = 2\,DE + GK$$

$$(5) \quad y_1 = \frac{2\,D^2E + G^2K}{2A}$$

$$(6) \quad y_2 = D - y_1$$

$$(7) \quad I_x = 1/3\,[Hy_1^3 + 2\,Ey_2^3 - K\,(y_1 - G)^3]$$

The bearing shell must be rigid within itself, even though the forces transmitted to the bearing are distributed evenly over that portion which is clamped in the forked connecting rod, since the plain rod working over the center section must be provided with clearance and consequently cannot be depended upon for support. Consider the total force on the forked connecting rod as proportional to the piston area, and that no distortion exists in the fork; the relative deflection of the bearing shell can then be determined by the following equation, the dimensions (Fig. 3) being inserted in inches.

$$(8) \quad ky = \frac{D^3b^3}{Ed^3t}$$

where

y = absolute deflection of bearing shell.
k = constant.
D = diameter of the cylinder.
b = distance between bearings.
d = mean diameter of bearing shell.
t = thickness of bearing shell.
E = Young's modulus of elasticity of the material.

To judge by the above equation, the most important physical property of a bearing-shell material is its modulus of elasticity. Although there is considerable variation of this property among bronzes, it is rarely if ever specified in conjunction with the material. Table I, which gives the modulus of elasticity of various metals employed

TABLE I

Material	Modulus of Elasticity
Steel	28 to 31 x 10^6 (Average 30 x 10^6)
Manganese Bronze	13.5 to 16 x 10^6
Aluminum Bronze	14.5 to 16 x 10^6
Gun Metal (Zinc Bronze)	11.5 to 14 x 10^6
Phosphor Bronze	14.9 to 17.3 x 10^6 (Average 16 x 10^6)

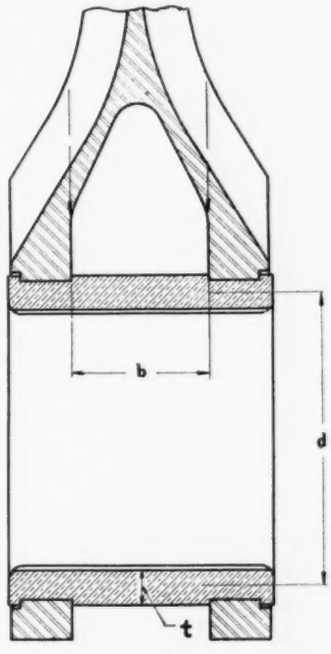


Fig. 5—Diagram of load on bearing shell of forked-type connecting rod

in bearing shells, clearly shows the superiority of steel from the standpoint of rigidity.

In Table II are given values for the relative deflection in the crank-pin bearings of four well-known engines employing forked connecting-rods with bronze bearing-shells. No consistent bearing trouble is experienced in service with the first two engines mentioned, while there has been

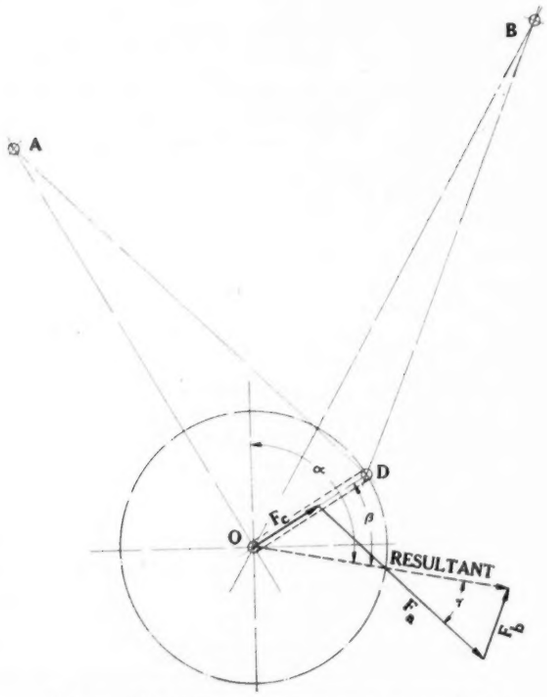


Fig. 4—Diagram of forces on the crank-pin of a V-type engine

marked evidence of deflection in the crank-pin bearings of the latter two. Although some of this deflection is undoubtedly caused by connecting rod distortion, we are justified in assuming that deflection factors above 100×10^{-8} are not permissible. Changes have been recently made in the connecting rods and their bearings of engines *C* and *C'* which bid fair to overcome this trouble.

TABLE II

Engine	*D*	*b*	*d*	*t*	*ky*
A	5.0	1.31	2.73	.295	60.3×10^{-8}
B	5.51	1.125	2.46	.296	61.3×10^{-8}
C	5.75	1.5	2.84	.281	108.2×10^{-8}
C'	5.0	1.375	2.41	.219	132.4×10^{-8}

Steel, with its higher modulus of elasticity and lower specific gravity, is obviously a better bearing-shell material than bronze, as regards rigidity and light weight; but it has not been extensively used, owing to the fact that it is more difficult to effect a suitable bond between babbitt and steel. This difficulty is particularly experienced with alloy-steels, thus precluding the practicability of eliminating the separate shell for ordinary mass production. Separate bearing shells of carbon-steel are employed by some manufacturers with excellent results.

Loading

Crank-pin bearing loads should be computed in the same manner for all types of engines, in order to obtain comparative values. The most accurate method for determining the forces involved is to first construct polar diagrams showing the magnitude and direction of the forces about the crank-pin axis for a complete cycle.

Fig. 4 shows diagrammatically the method of obtaining the various points of a polar diagram of forces about the crank-pin of a V-type engine. At selected crank intervals, the resultant forces (F_r), along the axis of each of the connecting rods operating upon a single crank-pin, are laid out to a convenient scale in their respective directions and then combined with the centrifugal force (F_c) of the rotating mass of the connecting rods. The forces along the axis of the rod are components of the resultant axial cylinder forces — gas pressure and inertia. The speed for which these forces are computed is usually the normal speed of the engine, and the crank intervals are chosen at 10, 15, or 20 deg., depending upon which is the most convenient. In V, W, or radial-type engines, it is best to select intervals that will divide evenly into the angle between cylinders.

It is possible to readily determine the magnitude and direction of the forces on the crank-pin at any crank position, if the polar diagrams are plotted with reference to the axis of the crank-arm, as in Figs. 5, 6, 7. These forces, or their reactions, can also be referred to the connecting-rod axis by correcting for angularity whenever it is desired to study the stresses or distortion in the big end of the rod as affecting the distribution of loads on the bearing.

The computed mean load and the peripheral speed are

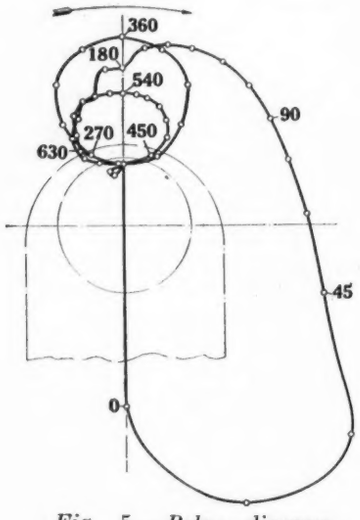


Fig. 5 — Polar diagram showing the magnitude and direction of forces on a crank-pin of a vertical type engine with respect to the axis of the crank-arm

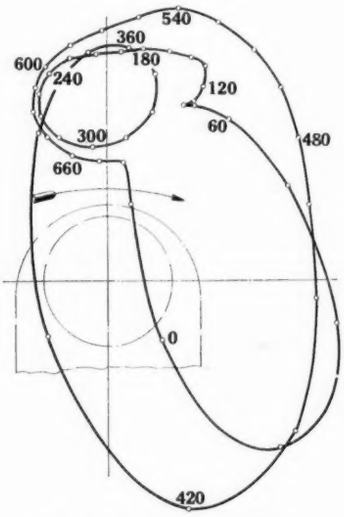


Fig. 6 — Polar diagram showing the magnitude and direction of forces on a crank-pin of a V-type engine with respect to the axis of the crank-arm

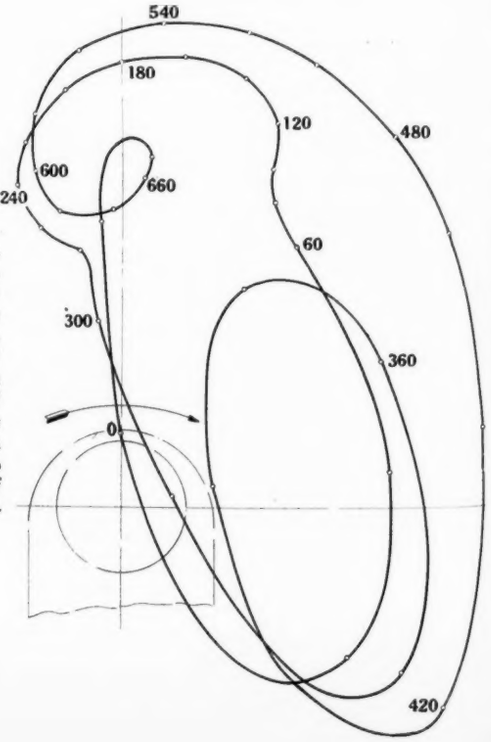


Fig. 7 — Polar diagram showing the magnitude and direction of forces on a crank-pin of a W-type engine with respect to the axis of the crank-arm

Table III
Dimensions, Loads, and Rubbing Factors of Several Well-Known Airplane Engines of Various Types

Type	Engine	Bore and Stroke, In.	Normal R.P.M.	Approx. H.P. Delivered Per Crank Pin	No. Cyl. Per Crank Pin	Centrifugal Weight Per Crank Pin Lb.	Reciprocating Weight per Cylinder, Lb.	Crank-pin Diameter, In.	Effective Bearing Length, In.	Projected Bearing Area, Sq. In.	Bearing Pressure Lb. per Sq. In.		Rubbing Velocity Ft. Per Sec.	Rubbing Factor	Usual Oil Pressure Lb. Per Sq. In.
											Max.	Mean			
6-Cyl. Vertical	Liberty.....6	5x7	1800	40	1	3.7	5.9	2⅜	2⅜	5.2	1060	468	18.66	8750	40
	Maybach.....	6.50x7.09	1400	47	1	5.14	17.35	2.6	2.6	6.76	1730	520	15.85	8250	6
	Rausie.....E6	5x6	1650	29	1	3.73	5.95	2⅛	2⅛	4.52	1640	454	15.3	6950	45
8-Cyl. V	Hispano.....300	5.51x5.90	1800	80	2-90°V.	6.2	7.2	2⅛	2⅜	5.04	1586	856	16.7	14360	70
	Wright.....H2	5.51x5.90	2000	100	2-90°V.	6.2	6.06	2⅛	2 7/16	5.19	1835	944	18.55	17520	70
12-Cyl. V	Curtiss.....K12	4½x6	2250	70	2-60°V.	4.40	3.25	2½	1⅞	4.73	1036	759	24.6	18675	85
	Curtiss.....C.D.12	4½x6	2000	64	2-60°V.	4.30	3.00	2½	1 11/16	4.88	1126	626	21.8	13640	90
	Liberty.....12	5x7	1700	70	2-45°V.	6.3	6.2	2⅜	2 7/16	5.2	1035	750	17.6	13200	40
	Packard.....1237	5x5¼	1800	50	2-60°V.	5.01	5.83	2¼	2¼	5.06	1080	580	17.5	10150	40
	Packard.....2025	5¾x6½	1800	90	2-60°V.	8.02	8.06	2½	2 7/16	6.08	1220	840	19.65	16500	55
	Rolls-Royce.....Eagle	4½x6½	1800	59	2-60°V.	3.95	3.75	2¼	1⅞	4.23	1180	624	17.7	11050	40
12-Cyl W	Napier Lion.....	5½x5⅛	1925	115	3-60°W.	6.4	5.5	2¾	2¾	7.55	1100	629	23.1	14500	50
18-Cyl. W	U. S. A....Model W-1	5½x6½	1800	133	3-40°W.	11.2	7.4	3	2 7/16	7.31	1250	872	23.5	20500	50
	U. S. A...Model W-2.	6½x7½	1400	167	3-40°W.	16.3	11.4	3⅜	2½	8.43	1145	819	20.6	16900	40
3-Cyl. Radial	Lawrance.....L	4¼x5¼	1600	56	3-Radial	4.50	3.05	1⅞	2½	4.7	906	464	13.07	6060	10
9-Cyl. Radial	Lawrance.....J	4½x5½	1800	220	9-Radial	17.19	4.16	2	3.45	6.9	1188	971	15.7	15250	30

the factors that generally determine the size of the bearing.

The maximum load must also be considered, for if the safe stress of the bearing metal is exceeded or the film of oil broken for an extended period, it may prove serious. The crank-pin bearing diameter is based upon the allowable stress and the engine torque. The effective length—fillets neglected—is then computed by the well-known formula as follows:

$$(9) \quad L = \frac{A}{D}$$

where L = effective length (inches).
A = required projected area (sq. in.).
D = diameter (inches).

The required projected area of the bearing is found by dividing the mean total load by the safe unit load as follows:

$$(10) \quad A = \frac{P}{p}$$

where P = mean total load (lbs.)
p = safe unit load (lbs. per sq. in. projected area).

The safe unit load (p) is affected by various conditions and therefore is variable to a certain extent. It is influenced more by speed than by anything else, and this is taken account of in design by the use of a

$$(11) \quad \text{Rubbing Factor} = p \times V.$$

where V = peripheral velocity of the bearing (ft. per sec.).

(To be continued)

Tire Condition Affects Impact

NINE major conclusions have been reached as a result of impact tests made by the Division of Tests of the U. S. Bureau of Public Roads at the Arlington Experiment Station. A. T. Goldbeck, chief of the division, announced these conclusions in a speech made recently before the annual meeting of the American Road Builders' Association. They were as follows:

Impact depends largely upon the kind and condition of the tire.

Thin or worn solid rubber tires, even though they be very wide, produce very high impact forces.

Pneumatic tires offer the greatest influence in reducing impact forces, and with their use the impact increases only very slightly with the speed of the truck.

Cushion tires, that is, tires having a degree of softness and deflection between solids and pneumatics, offer corresponding advantages in reducing impact.

Impact increases with the speed of the truck, but it can not be said to increase according to any constant ratio or power of the speed.

Although heavy unsprung weight may give higher impact than lighter unsprung weight, it can not be said that this is the major controlling factor.

The relative destructive effect produced by lightweight, high-speed trucks and heavy, slow-moving trucks has not been determined by these tests. They do, however, indicate that equal impact may be obtained under some conditions.

Impact may be as high as 7 times the static load on one rear wheel when a solid-tired truck strikes a 1-in. obstruction at 16 miles per hour, an average value being about 4 times. For pneumatic tires the maximum impact value is probably not more than 1¾ times the load at one rear wheel, and an average value is not more than 1¼ times the load.

All cushion wheels do not reduce impact on the road surface even though they may cushion the vehicle.

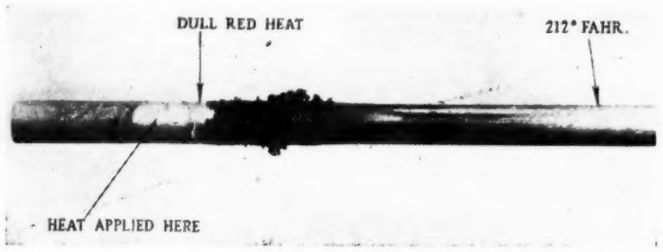
"This series of impact tests will be continued," Goldbeck said, "with the use of motor vehicles operated on actual road surfaces. and equipped with devices for directly measuring the impact under actual road conditions."

Deposits of Carbon Are Influenced by Temperature of Surface

Rate of formation highest at intermediate temperatures of combustion chamber walls. Either higher or lower temperatures tend to prevent deposits. Same result noted in case of bar to which oil is applied when one end is at cherry red heat and the other end is comparatively cool.

TESTS made recently at the Bureau of Standards by S. W. Sparrow afford a striking example of the extent to which the formation of carbon deposits depends upon the temperature of the metal upon which they are formed. The formation is least rapid at certain intermediate temperatures, that is at temperatures between the two extremes which occur in the walls of the combustion chamber of an engine. Certain temperatures are favorable to the formation of carbon, and since the temperature of various parts such as the piston heads and spark plugs varies with variations in load, different loads have different effects upon the same parts, as will be seen by reference to the following report:

The tests included two series of runs with a single-cylinder Liberty engine. Each series was of 15 hours' duration. In both series the engine speed was the same—1500 r.p.m., and the temperature of jacket was held constant at 140 deg. Fahr. The two series differed with regard to load; one series being made with the engine developing about 33 indicated horsepower and the other with about one-third of this power development. Aviation gasoline and Liberty Aero Oil were used in both tests and the mixture ratio was approximately the same in both cases, namely, that giving the maximum power.



Photograph of bar to which heat was applied at one end and oil was applied uniformly. Carbon formed between hottest and coldest parts

An examination of the engine at the end of the full load run showed a carbon deposit of at least .020 inch thickness over the entire piston head. The spark plug, which is located in the head, was entirely free from carbon. At the end of the part load runs conditions were reversed. Not only were the spark plugs badly fouled but it was necessary to replace fouled plugs with clean ones three times in order to complete the 15-hour test. In this case, however, there was no carbon deposit on the piston head. A repetition of both series showed similar results.

From these results it is concluded that at full load the temperature of the piston head was favorable for the formation of carbon and the temperature of the spark plug too high. At part load the temperature of the spark plug appears to have been favorable for carbon formation and the temperature of the piston head too low. No surprise is likely to be occasioned by the fact that the spark plugs remained clean at full load. One frequently hears of spark plugs being designed to run hot enough to burn clean, and freedom from carbon trouble is usually expected from engines which operate for the most part at full load.

General opinion, however, does not check the possibility of any of the combustion chamber walls such as the piston head being too cool for the formation of carbon at part load. In motor car practice, a more rapid accumulation of carbon usually results from city driving with its large proportion of low throttle operation than from open country running. The results are not inconsistent. When a car leaves the curb after its engine has been idling a long time, there is often a cloud of smoke indicating that an excessive amount of oil is being burned. The fact that an abnormal amount of oil had accumulated in the combustion chamber without being burned is evidence of a condition in which wall temperatures were too low for the formation of carbon. It is probable that more carbon will be deposited when oil is allowed to accumulate and then be burned than when the oil which enters the combustion chamber is burned on the next power stroke.

To check qualitatively the engine test results the following experiment was made. A bar of steel 7/8-in. in diameter was mounted in such a way that it was possible to heat one end to a cherry red. The temperature was lower the greater the distance from the source of heat, being about 212 deg. Fahr. at a section 16 in. from the cherry red portion. Oil of the same grade used in the engine test was allowed to drip uniformly from end to end on the rod and, as was expected from the engine tests, there was a rather rapid formation on a part of the rod and no carbon deposited on a portion somewhat hotter or one somewhat colder. No record of the temperatures of various parts of the bar or of the cylinder head, piston head or spark plug were made.

These results, although all qualitative, are mentioned as indicating a line of investigation that may yield quantitative results of value. For example, it might prove desirable to compare oils by determining how much change in the temperature of a metal surface is necessary to bring it from the condition where it is too cold for the formation of carbon to the condition where it is too hot for such formation.

From the facts here discussed it would appear that, for

a given oil, the rate at which carbon accumulates in an engine depends not only upon the amount of oil that enters the combustion chamber but also upon whether or not the temperature of the combustion chamber walls during the greater portion of the time the engine is in operation are favorable to the formation of carbon. In this connection it will be of interest to observe whether the rate of carbon formation changes with change in piston design or material and particularly whether or not differences are observed between water-cooled and air-cooled cylinders.

More definite information as to the temperatures at which carbon formation is most rapid can undoubtedly be obtained to better advantage by other methods than by the use of the heated bar. Further experiments are being made on automobile engines and more information is being gathered concerning the temperature range over which carbon formation occurs with various oils.

Airplane Design Influences Operating Cost Materially

MANY erroneous ideas are extant as to the possibilities in commercial flying, according to Archibald Black, who read a paper on the above subject before the American Society of Mechanical Engineers at its recent meeting in New York. Thus it is often held that continuous flights of 8 or 10 hours are possible commercially, that speeds of 125 to 130 m.p.h. are practicable, that twin-engined machines should be capable of flying with only one engine running, that a factor of safety of 8 or more is desirable, that comparatively high climbing ability is practicable and desirable, and that very large airplanes are most suitable for commercial flying. Black in his paper analyzes these suppositions, basing his study on data gathered for clients by his firm and on a report of the British Advisory Committee for Aeronautics (Reports and Memoranda No. 676). He explains that his conclusions apply directly only to machines designed on conventional lines.

Reliable Cost Data Scarce

Available data on the cost of operating commercial airplanes are very meager and practically limited to the records of the U. S. air mail service, which may be regarded in every way as a commercial air line. Incidentally, it is the largest commercial air service in the world. An allowance has been made in the calculation for interest on investments. Unfortunately, this is not complete; but it is apparently only a small factor, and even if doubled it would only increase the cost by 3.4 per cent. The report of the mail service for the twelve months which ended June 30, 1921, shows the average cost of operating its Liberty 420 hp. engined airplanes to have been $71.13 per flying hour.

Black states that there has been some talk of making the flight from New York to Chicago, which is from 750 to 800 miles, without an intermediate stop. He presents a chart showing that the cost of operation per pound-mile or passenger mile increases gradually with the length of a non-stop flight up to 4 or 5 hours and then increases much more rapidly, so that the cost of operating machines in flights of over 6 hours' duration becomes prohibitive.

The effects of speed, climb and reserve horse power on the operating cost are considered together, as these factors are interdependent if the landing speed remains constant.

The following conclusions are drawn from the data presented in the paper:

Duration. The designed duration should not exceed the minimum necessary to complete scheduled trips safely in a head wind and that, for the type considered, it should not in any case exceed four hours.

Factor of Safety. The factor of safety should be kept to the minimum consistent with the conditions and should in no case exceed six.

High Speed. High speeds beyond those accompanying the necessary reserve horsepower are undesirable and, for the type considered, the high speed should not exceed 105 to 110 m.p.h. at 5000 ft.

Climbing Speed. Climbing speed should be only sufficient to provide a reasonable margin of safety for emergencies, and an initial rate of climb of 400 to 500 ft. (from the altitude of the operating field) in the first minute is proposed as a tentative standard.

Reserve Horsepower. Reserve horsepower should be kept down to that necessary to provide the required climbing speed.

Flying on One out of Two Engines. Flying on one out of two engines is utterly impracticable, because of prohibitive cost.

Flying on Two out of Three Engines. The requirement of ability to fly on two out of three engines is reasonable and practicable.

Safety Requirements. Initial rate of climb instead of reserve horsepower or speed range should be the measure of safe performance.

Size. The moderate-sized machine is the most efficient at present, and for the type considered this size is about 500 to 600 sq. ft. in area.

Operating Cost. Aircraft designed for commercial purposes and fully loaded can be operated conservatively at a total cost of 0.030 to 0.032 cent per pound-mile or about 6.5 cents per passenger-mile, not including the cost of obtaining the business, and that this cost cannot be even approached by machines not suited to the purpose.

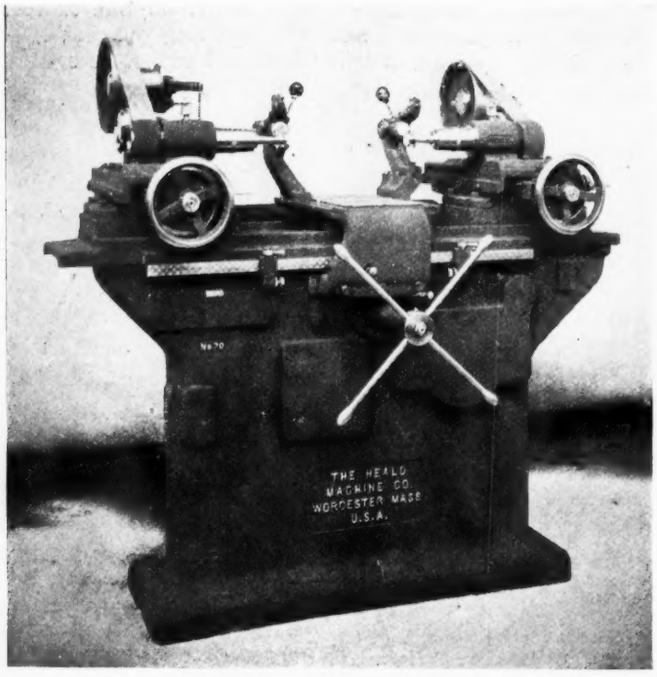
Division of operating costs for U. S. air mail service

Redesign Grinding Machines to Increase Rate of Production

Heald Company incorporates new idler with wider belts on grinding heads suitable for both old and new models with view to augmenting output. Double head on another tool and hydraulic drive on a third type accomplish similar objective.

ALTHOUGH grinding machines are extensively used, in the automotive industry for a wide variety of operations in which close limits are required, there would be a still wider application if their rate of production could be materially increased. Manufacturers of grinding machines appreciate this situation and are taking steps to so design their machines as to increase production rates.

A case in point is that of the Heald Machine Co., which has altered its internal grinding machine for both automatic and hand feed to meet the requirements for grinding parts in which the hole in each end must be finished with absolute alignment. This has been accomplished by the use of a special table on which two wheelheads instead of one are mounted. A bridge in the center is arranged to carry a special fixture in which the work is held and revolved. The wheelheads each have an individual drive and are adjustable in such a way as to permit of grinding from both ends holes of the same or quite different diameters and with or without shoulders. For long holes without shoulders the power feed machine is recommended. The hand feed machine, however, is of simpler construction and is said to be entirely satisfactory for short holes and also when there is a thrust shoulder to be ground.



Double-head hand feed Heald grinder for simultaneous grinding of concentric holes in each end of a piece

The grinding heads of the new machine have been redesigned to incorporate an idler which gives the belt an 85 per cent wrap on the wheelhead pulley and thus tends to eliminate belt slippage. The machines are provided with a swinging type diamond truing device which permits of truing the wheel without disturbing the relation of the wheel to the work.

The manufacturer states that these machines are now being used successfully for grinding bearing cages, automobile wheel hubs and gear clusters or countershafts.

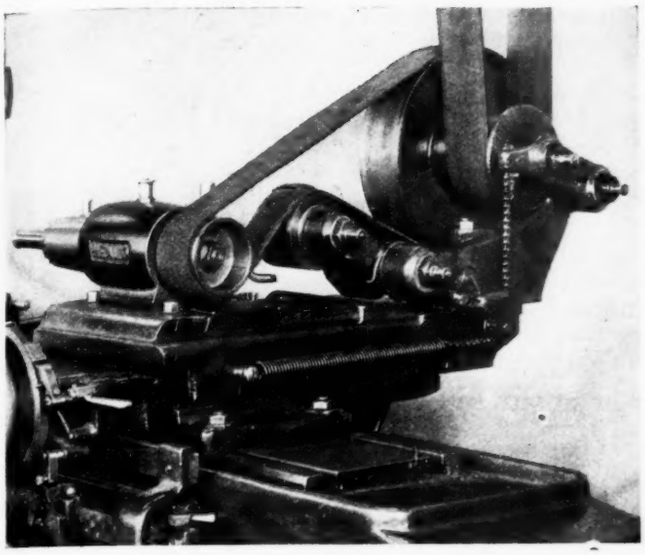
Makes Feasible New Types of Design

The makers claim that the new machine will make possible certain types of design, combining two or more parts having a suitable bearing at each end into one part when formerly such construction had to be avoided, due to the difficulties of lining up the two holes. In such cases it was often necessary to use long holes of small diameter, going from one end of the piece to the other. Now shoulder holes can be employed and parts such as ball bearings can be housed conveniently in absolute alignment.

The Heald Co. has also recently designed and is now producing a new drive for the wheelheads on styles No. 70 and 75 internal grinder, as well as for the smaller internal grinder known as style 80 and 85. The new design incorporates an idler which is interchangeable with the idler used on older style heads. Its purpose is to decrease belt slippage, thereby making heavier cuts possible. The width of belt from driving shaft to large pulley has been increased from 2 to 3 in. and that from the large pulley to the wheelhead pulley from 1½ to 2½ in. Due to the idler, the arc of contact on the wheelhead belt has been increased from 45 to 85 per cent.

The idler is held in contact with the belt by the use of a spring acting on a lever arm attached to the idler pulley. The idler not only increases the belt tension but also reduces the strain on the wheelhead bearing. With the new device it is said to be possible to remove from 10 to 15 thousandths of an inch of cast iron in the same time formerly required to remove from 3 to 5 thousandths. By the use of the newly designed head it is said to have been possible in some cases to increase the production rate as much as 200 per cent.

Another addition to the Heald line is a new internal grinding machine known as style No. 72. This machine is similar in some respects to style No. 70 except that it is equipped with a new automatic and entirely gearless hydraulic drive for the table which enables the operator



Idler with belt tension pulleys designed to increase production on Models 70, 75, 80 and 85, Heald grinders

to secure instantly any speed or reverse with minimum effort.

The wheelhead differs from that used on type 70 in that it incorporates the wider belt and idler construction referred to above. The base of the type 72 machine serves as an oil reservoir from which the oil for the hydraulic drive is pumped. The hydraulic mechanism is controlled by an automatic valve, placed in front of the base in such position that the operator's hand is normally close to it. A convenient stop is provided so that it is possible to maintain or return to any particular speed without having to look at the speed change lever. A lever engaging a friction clutch on the inside of the spindle drive pulley starts and stops the water supply.

The work can be swiveled upon the head which is mounted on a heavy bridge. This swiveling of the work permits of taper grinding. The graduations are provided, showing the taper in degrees as well as in inches per foot.

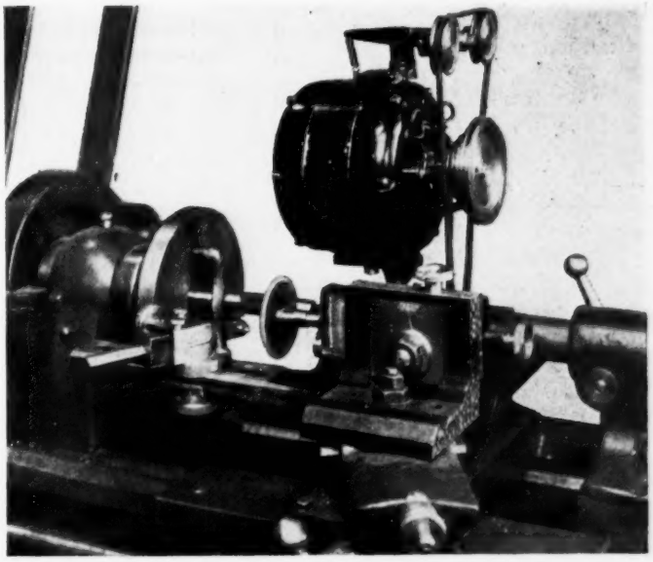
The cross slide which carries the flexible idler and wheelhead is mounted on the table. A positive stop enables the operator to grind up to a given size without stopping to gage the diameter. A fine adjustment to compensate for wheel wear is provided.

The use of the hydraulic drive and the newer type of wheelhead is said to have materially increased production speeds over earlier models. Wheelheads can be furnished in 19 different sizes so that it is an easy matter to select the best size of spindle for the particular job in hand. The machine swings work up to 15 in. in diameter and will grind holes 11 in. deep.

New Machine Grinds Threads and Fillets

A SPECIAL grinding attachment for lathes has recently been placed upon the market by the Precision Thread Grinder Mfg. Co. It is intended primarily for the grinding of internal and external threads, but can be used for other more or less special operations such as the grinding of concave and convex radii and straight or tapered surfaces either internal or external. The tool is provided with the following graduations: vertical, longitudinal, angular, automatic vertical, truing bar and swivel on the diamond holder dial. It will thus be seen that there are graduations for each of the five different traverses.

By the use of these graduations the wheel can be brought to the desired level, sizes, or spaced distances, without the necessity of stopping the machine to measure the work. The parts of the machine are carefully balanced in order to avoid chattering and the machine itself is made in two models for mounting on the tool rest either in front or to the rear of the lathe center. Although the machine was developed especially for precision grinding work on thread gages and other special metal tools, it is said to have been successfully employed in grinding threads on hard rubber.



Precision thread grinder with multiple graduations and five traverses

ASSAY tests on a sample of Brazilian "turfa" have recently been completed at the Boulder, Colo., field office of the Bureau of Mines. This material is a soft brownish-yellow substance, having an apparent specific gravity less than that of water. It yields on distillation as much as 113 gal. of crude oil of 0.870 specific gravity, and, in addition, up to 6 gal. of scrubber naphtha per ton, of the raw material.

The oil is stated to be of very good quality as shale oils go, and the material also gives a relatively high yield of gas. In retorting, the turfa shrinks to about one-third of its original volume, and forms a weakly adherent coke probably of fair fuel value.

The effect of rate of oil production on the quality of oil was, it is reported, shown up very strikingly in the examination of this material. For example, gasoline produced from oil made from this material at the rate of 1 cc. per minute was 34.0 per cent unsaturated, while the kerosene fraction was 41.5 per cent unsaturated. From crude oil produced at the rate of 0.2 cc. per minute, the gasoline produced was 30.1 per cent and the kerosene 33.6 per cent unsaturated.

Better Dealers and Market Analysis Immediate Sales Needs

St. Elmo Lewis tells motorcycle manufacturers pertinent facts about merchandising. Says an industry is no bigger than the men who make it. Accurate data needed about selling possibilities. Too much reliance in past on gossip, opinions and idle chatter.

THE manufacturer must realize that the dealer is his business partner and must conduct dealer relationships on that basis, if maximum sales possibilities are to be realized, St. Elmo Lewis told a large group of motorcycle manufacturers and dealers in New York recently. Other important points which Lewis made in his address before the Motorcycle and Allied Trades Association were:

Dealers cannot be treated like orphan children and then be expected to return 100 per cent loyalty to the factory.

More accurate and detailed marketing facts must be developed concerning sales territories. Too much reliance has been placed on opinions, gossip and idle chatter of men not trained observers, who see only what they wish to see.

An industry is as big as the men who compose it. Its progress will be as rapid as their progress. If manufacturers want to know what is the matter with their industry they can spot the cause any morning when they are shaving themselves.

ST. ELMO LEWIS, Vice-President of the Campbell-Ewald Co., told motorcycle manufacturers what is wrong with their business, in an address made before the Motorcycle and Allied Trades Association in New York recently. Much of what he said is equally applicable to the automobile industry.

Car and truck builders in general have advanced beyond the motorcycle manufacturers in marketing and merchandising methods. But the number of comments in this speech that apply equally well to both industries indicates that the difference is not so great as might commonly be thought.

St. Elmo Lewis is recognized as an authority on selling. Car and truck sales managers can profit by many of the remarks he makes about the motorcycle industry.

Many of the comments made by Lewis apply with equal force to car and truck marketing methods. He said in part:

THE boasted progress of the human race is but a small fraction of what it might be if men exercised the three qualities which differentiate or make them different from the rest of the animal world.

1. If they are willing to learn by experience of others; if they can take all the facts lying beneath their eyes, and accurately correlate these into plans of action.
2. If they are willing to *think.*
3. If they will act on what they think.

One of the greatest psychologists and nerve specialists that I ever knew, one time told me, "It is my solemn opinion, as a man of science, that many men would rather lie down and die than think, and I say this as a result of forty years' active practice in the handling of mental diseases."

Some of you still think that you know all about your business. When you know all about it, you are through—done—finished—dead—because there is nobody in the world, in no occupation in the world, who knows *all* about anything.

We all like to think our business is different, because we like to think ourselves different. You like to think that you have individuality, personality, certain qualities of character, appearance, etc., that differentiate you from everybody else. But you have five senses. You are made pretty much alike, and you have different ways of thinking about things, but you have to think.

The most of us spend all our lives trying to do differently those things which common experience proves we should have tried only to do better, but many of us merely try to do them differently.

The most successful men in America are those who have taken a good thing, no matter in what business it was, no matter by what man it was proposed, and made it their own.

A friend of mine on one occasion, when asked by a man whether he had ever been in the business or not, made a statement: "I cannot lay an egg, but I can tell a bad one."

The motorcycle industry is never going to be any bigger than the men in it. It is never going to have any bigger future than its manufacturers and its dealers can see. It is never going to be any better, any bigger, any broader than the men who control it.

IF there is anything the matter with the motorcycle industry you can spot the cause of it any morning when you are shaving yourself.

Just let that be definitely and distinctly understood. You can pass the buck as much as you please—the dealer can blame the manufacturer, the manufacturer can

blame the dealer and the both of them can blame the consumer—but the consumer has nothing whatever to do with it.

The motorcycle dealer complains of the high price of parts. This seems legitimate within certain restrictions.

The motorcycle manufacturer has depended too much upon "glad-hand" artists, instead of constructive merchandisers, for representation.

IT has only been within a comparatively recent time that the manufacturer has made any attempt to get any real marketing facts about his territory, but has depended upon opinions, gossip and the idle chatter of men who are not trained observers, and who see only what they wish to see.

The manufacturer must ultimately realize that the dealer is in partnership with him in the business of developing a demand for your commodity. The dealer is just as much a part of the manufacturer's sales organization as the salesman, the factory hands or the executive department. He is subject to the same supervision, development and care as any proper management gives to those who are more intimately a part of the plant. You cannot treat a retailer in any other way, and if he is not worth treating that way, then he is not worth having.

You cannot take an employee and treat him as if he were an orphan child, or give him no consideration and expect to get back loyalty, 100 per cent cooperation, confidence and faith. You must support him, you must strive in every way to help him make money, because if he fails, the manufacturer also fails in that community to a degree which many of them do not seem to see.

The most conspicuous successes in manufacturing are those that treat the retail outlets as an essential and integral part of the manufacturer's distributing machine. There is a growing tendency on the part of the manufacturers in all lines to realize this. That is one of the hopeful signs, because it will mean the elimination of ignorant, unintelligent retailers, the substitution for such of the business man, the merchandiser, and the constructive representative. Just in proportion as the manufacturer's retail organizations take upon themselves this new complexion, as a result of the manufacturer realizing that he is responsible for the people who handle his product to the consumer who buys it, the manufacturer will get his greatest, most stable results.

THE dealer ought to take an interest in his local Chamber of Commerce; he ought to be *a real business man* with a real business in his community, and an interest in the people who are going to support him.

He ought to get together with his competitors and talk things over, and be friends with them. Friendliness is developing business in this country—not hate, which begets friction, loss and heat.

American Cars Predominate at New Zealand's Annual Show

THE annual Olympic motor show in New Zealand was held at Christchurch last November. This photograph shows a general view of the show, which was a successful one from the point of sales and in which American cars predominated. The New Zealand Motor Trade Association, Canterbury branch, was in charge.

Marine Engines Show Influence of Automobile Practice

Motor Boat Show in New York marked by appearance of several new power plants. Application to railcar work seen for first time. Greater refinement in lay-out and workmanship evident. New type of gear pump shown. Better accessibility needed.

IMPRESSIONS which an engineer, who is more familiar with passenger car and truck construction than with that branch of automotive engineering which has to do with the design of motor boats and their engines, carries away after a visit to the Motor Boat Show now in progress in New York, is to the effect that motor boat engines are tending more and more towards automobile practice, or in some cases toward aeronautic engine practice. This is no reflection upon the designer of marine engines. It is rather an indication that he is alive to the numerous improvements that have been made in automobile and aircraft engines and sees the desirability of incorporating similar improvements in his own product, so far as they are applicable.

Some marine engines embodying extremely crude design and construction are still to be found, but on the whole greater refinement in design and workmanship are in evidence, and there are several examples of engines which compare favorably both in design and construction with the finest engines employed, even in the highest grade automobiles and aircraft practice.

New Engines Exhibited

Among the new engines exhibited are the two Packard models, the Van Blerck, Wisconsin "White Cap" models, the Kermath, the Gernandt and the Stearns. It will be noted that some of these names are quite well known in the automobile industry and that one of the engines, the Packard, is put out by an automobile manufacturer.

Many of the engines carry electrical units such as are standard on nearly all American passenger cars today. In general these units are designed into the engine rather than attached as an afterthought as they were at one time both in marine and in automobile practice. At least one of the large heavy duty engines, the Sterling "Viking," is fitted with two starting motors, one placed on each side of the engine and so arranged that their pinions mesh with the same flywheel gear. These motors are connected in parallel and are understood to function satisfactorily.

A considerable number of engines are fitted with overhead valve gears, some of these following closely aeronautic practice with fully inclosed camshafts. In several cases the valves are inclined and in some there are four valves per cylinder. Several of the overhead camshafts are driven by bevel gears, some of which are straight tooth and others of the spiral tooth type.

The use of detachable heads is, of course, quite common, and in some engines a third casting, arranged to carry the valve actuating mechanism is employed. The valve arrangement used in the Packard engine is quite unusual in that the valves which are arranged in an L head are actuated by rocker arms which are hinged at their outer ends to detachable castings bolted to the crankcase. Follower surfaces near the center of the rocker arms bear against the cams, while the outer ends of the rockers bear against the valve lifters.

Fuel Vaporization Improved

What some might consider an indication of the influence of automobile design is the rather common use of intake and exhaust manifolds which are either cast in one piece or so arranged as to have a common wall forming a hot spot at a point where unvaporized fuel is thrown from the air stream. In some cases the inlet manifold is simply jacketed with hot water from the cylinder jackets, but the use of less volatile fuels, which for several years has had a marked influence on automobile engine design, together with the fact that cold jacket water is employed has made it very necessary to provide some special means of assisting vaporization in order to minimize the troubles from dilution of crankcase oil which would otherwise be very pronounced, at least with many of the piston designs commonly used.

Among the most interesting exhibits was that of the Sterling Engine Co. in which there was shown a total of nine engines. The two largest of these are known as the "Sea-Gull" and "Viking" models and are similar in general design except that "Viking" has two camshafts instead of one as used on the "Sea-Gull." These are not new engines but are examples of an excellent design and of unusually high grade workmanship. The main cylinder castings are formed in a single block containing inserted liners which are machined all over.

Sterling Valve Mechanism

The overhead camshafts are driven by spiral bevel gearing and have seven bearings. An unusual feature is the use of roller followers carried in short cylindrical tappet blocks which take the side thrust of the cams. While this type of tappet is often employed in L-head engines, it is seldom seen in overhead valve types.

Another unusual feature of this engine lies in the use of oil and water pumps constructed under Fuerheerd patents. This is a peculiar form of gear pump in which a three-toothed pinion meshes with a four-toothed internal gear ring. Both the pinion and the gear rotate, but with a differential action which results in the desired pumping. This type of pump is said to have a longer life than most gear pumps, especially when required to handle water or oil containing abrasive sediment.

Another feature of this engine is the use of an exceptionally large external oil filter which is water-cooled. This filter is arranged with a series of concentric screens which are progressively finer, going from outside toward the center. A pressure gage is fitted on the pressure side of the strainers, and when this gage indicates a certain abnormally high reading, it serves as a signal to indicate that the filter requires cleaning. The screens are arranged for easy and rapid dismantling to facilitate cleaning.

Many of the better grade engines are fitted with pressure lubrication to all bearings. In some cases oil leads in connecting rods are provided to carry oil to the piston pins. In some instances, special means in the form of cold water piping are employed to prevent the oil supply from becoming overheated and thus retain its viscosity.

As noted above some automobile and automobile parts makers have entered or been for some time in the marine field. At least one marine engine builder has turned the tables by entering the motor vehicle parts field to the extent of furnishing engines for rail car use. The need for rail car purposes of an engine which has greater power, and at the same time better inherent balance than the largest four-cylinder truck engines commonly used today, has already been mentioned in these columns, and it seems quite possible that such an engine already exists in the marine field. In any case, some marine engines have, with slight modifications, been applied for use in gasoline propelled locomotives, and there would seem to be no reason why some of them cannot be used to advantage in rail car applications. Some of the better grade engines are not only very well built so far as finish and materials are concerned but are so balanced as to be relatively free from vibration, a characteristic which is highly desirable if not essential in rail car installations.

Accessibility Needs Attention

There is evidently considerable room for improvement in respect to accessibility in the case of many marine engines. Some of the newer designs have no hand holes in the crankcase and, consequently, no means for reaching parts in the case without removing the engine from the hull. Accessibility is rather difficult to attain in marine engines on account of the fact that they cannot be reached from the under side of the crankcase unless they are raised out of the hull. This fact must, of course, be appreciated by those who have designed engines without hand holes in the crankcase, the conclusion apparently being that, with modern pressure lubricating systems, the bearings require so little attention that ready access to the crankcase is unnecessary.

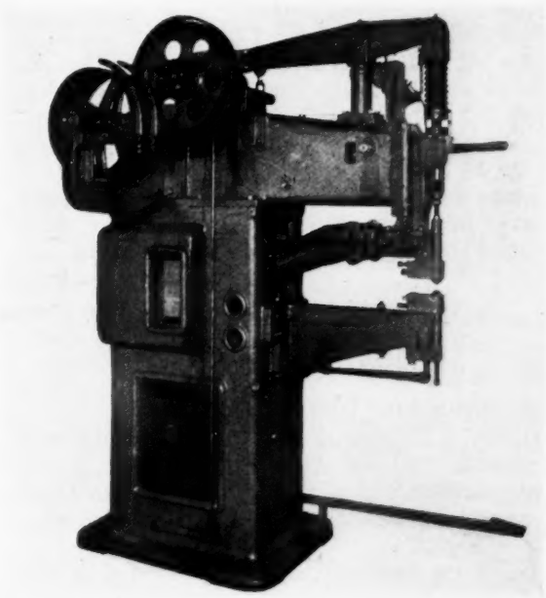
A feature which is said to be unique in the Packard marine engine is the use of a thermostat in the exhaust pipe jacket water outlet. This thermostat is so arranged as to control the flow of water which, after leaving the cylinder jackets, flows through the exhaust pipe jacket and consequently to control the cylinder jacket temperature.

An Automatic Spot Welder

A NEW spot welding machine known as Model 75 power automatic has recently been placed on the market by the Thomson Spot Welder Co. This is a 75 kw. machine (at 75 per cent power factor) and has a normal capacity of two 3/16-in. iron or steel plates and an overload capacity of two ¼-in. plates of the same material. It will also take two 3/32-in. brass or aluminum plates, normal, or two ⅛-in. plates of these metals on overload. The depth of throat is 2 ft.

The welder is fitted with a hand lever arranged to elevate the upper welding head or electrode 1¾ in. This, in addition to the normal ¾-in. opening, gives a total maximum opening between electrodes of 2½ in., which facilitates insertion and removal of work having flanges, ribs or angles. A trip clutch controlled by pedal is so arranged that the welder can be operated in cycles of one spot each or continuously as desired. Automatic make and brake switches are provided to control the panel contactor which can be set to suit the particular gage of stock being welded or the desired degree of indentation. The cutouts and the cam mechanism which operates the spring which controls the pressure on the electrodes are entirely automatic, thus eliminating the human element as far as the welding is concerned, so that the operator has only to place the work in the proper position and trip the pedal.

Electrodes or dies are of large diameter and the die block is water cooled with a view to securing long life of the dies. The cam mechanism is operated off a shaft with 3 x 15-in. driving pulley, which is normally operated at 94 to 100 r.p.m. This in turn operates the welder at a rate of 20 spots per minute. Half this speed is used on overload work. The spring is designed to give a maximum pressure of 2000 lb. at the die points.



Thomson automatic spot welder which welds at a rate of 20 spots per minute

More Executives Express Opinions on National Shows

Editor, AUTOMOTIVE INDUSTRIES:

National shows such as have been held in recent years are more or less elaborate considering actual sales resulting from them. A large percentage of the business secured at the New York show comes from dealers who have delayed signing contracts until they have seen the new models of the different lines, usually introduced at this time.

In my opinion if new models were not introduced at the New York show, or just prior to the show, the wholesale business would decrease 75 per cent. This business would not be lost but would be secured by the efforts of the sales organizations of the automobile companies.

I cannot see any benefit accruing to the retail field from the national automobile shows except to the dealers in the city where the show is located. The greatest benefit comes to them from the increase in number of prospects to be followed up after the show. Retail sales are not made because the prospect sees so many cars and hears the merits of so many makes that he becomes confused and is not in a position to make a choice to suit his particular need.

My solution of the retail problem would be to set aside a properly advertised show week and for each dealer to make a special display in his salesroom during that week. This arrangement would enable the dealers to handle their prospects to better advantage and also to put some effort into moving their used car stock which could be shown conveniently.

For the wholesale trade I would have one national show for all makes of cars, less elaborate than the present shows and in a city located centrally in the United States.

I think a central location would bring a larger attendance of live dealer prospects. Such a show would be considerably less expensive and would secure a larger amount of business. This would make the value of show sales compare more favorably with expenses.

A. M. FARNER,
President, Farner Motor Car Company.

Editor, AUTOMOTIVE INDUSTRIES:

Basically, I differ with Mr. Norval Hawkins as regards the value of National Automobile shows. I thoroughly believe that motor shows, both national and local, are of distinct advantage both to the industry and prospective buyers.

There is a widespread, far flung interest in motor cars exceeding the interest in any other manufactured product. It is my conviction, after sixteen years in the business, that the most potent stimulus to this interest, aside from the charm of the product itself, is the motor shows.

No man can stand in a booth at a national show and talk to the visitors without quickly coming to the conclusion that the thousands who attend are keenly interested in seeing the developments made in the previous year. They realize that motor shows provide an unequalled opportunity to appraise quickly and compare the offerings of the different manufacturers. In two hours a visitor can get a very good general impression of the development of the motor industry during the previous twelve months.

Many people are rather shy and hesitant about going into motor salesrooms to make investigations, thinking—although mistakenly—that there is a certain obligation attached to their visit. The payment of the admission fee to motor shows puts a person instantly at ease. Visitors feel that, without placing themselves under obligation, they are entitled to inspect and criticise and compare to their heart's content.

If certain manufacturers spend more money than they should on entertainment and in other non-productive channels, the problem is within their own control.

It is our observation that buyers are becoming much more keenly interested in the mechanism of motor cars, the chassis construction and the engineering details, because with increasing motor experience they realize that the engineering and mechanical standards of the machine are the essential factors, which primarily determine the satisfaction that their vehicle gives them.

It is our judgment that the comparison between the good and bad elements in the motor shows is preponderantly in favor of the good. It seems to us, therefore, that the logical method of operation would be, so far as possible, to eliminate the unsatisfactory and unwise practices of motor shows and retain that most efficient stimulus to public interest, continuing to give the public an entitled opportunity for comparing value and merit which only the motor shows can provide.

EARLE C. HOWARD,
Lafayette Motors Corporation.

Editor, AUTOMOTIVE INDUSTRIES:

In the writer's opinion the National Automobile Shows afford perhaps the best medium through which a new line of automobiles or one that is not well known may be shown to the greatest number of interested persons at the least expense.

So long as important changes continue to be made in automotive products from year to year, so long does the motor show appear to be a desirable institution.

L. LOGIE,
Sales Manager, Gray-Dort Motors, Ltd.

National Shows Sound Enterprises

Editor, AUTOMOTIVE INDUSTRIES:

Much as I respect the standing of Mr. Norval E. Hawkins in the motor car industry, I am forced to take issue with his rather sweeping condemnation of the National Automobile Show as an institution, as published in AUTOMOTIVE INDUSTRIES under date of Jan. 18.

To my mind the National Automobile Show is one of the most valuable factors for trade promotion in the entire industry. It is a sound business enterprise, yielding rich returns in the promotion of sales both at the show and in its immediate wake. Through its successful development, year after year, it has come to be the outstanding motor car event of the year. Motor car enthusiasts look forward to it for months, awaiting with the keenest interest what it may disclose in the way of developments of engineering, in motor vogue, and in refinements and improvements in cars with which they already are familiar.

If the motor car industry needs any justification for this method of exploiting its products, we may turn only to such enterprises as the Silk Show, that most gorgeous yearly event, staged at enormous expense in the interest of those affiliated with the silk industry. We might cite the impressive fashion shows of Paris, where are created the styles for fine garments for the entire world. At such exhibitions standards are set, the last word is spoken, and the public takes as authoritative the decisions that are reached in design, colors, textures, and all the manifold details of this intricate industry.

Likewise, at the National Automobile Show all the latest achievements of this industry are seen in tangible form. Side by side they are ranged for the inspection of the prospective car buyer. Here he can subject the various types of cars to careful scrutiny and intelligent comparison. All the vast fortunes that every motor car plant spends, year after year, in engineering, in laboratory research, in tests, are represented in the complete product thus displayed.

The general appeal of this method of displaying cars is apparent from the throngs that attend. The visitors pay a substantial admission charge; they endure the discomforts of dense congestion; at times they wait for hours to gain admission—still they come, and study, and learn by personal observation what the trade holds to interest them and to meet their particular requirements.

And if further evidence of the keen interest of the public were needed, I might cite the attitude of the press. The press has its fingers on the public pulse. It knows what the public wants. It discriminates most carefully lest it lend its columns to haphazards, catch-penny enterprises. The mere fact that the greatest American newspapers devote column after column to the show, not only in the show week itself, but for weeks in advance of the show, to my mind is most convincing proof of the stability of the show as a really national institution.

Individual exploitation of the car is splendid in theory. In fact, it fails to result in anything like the degree of satisfaction that attends the show method. We do not become showmen because we avail ourselves of this method. Good showmanship is an essential of good salesmanship. I cannot close without pointing out what to me was a highly significant feature of the show just closed—the intelligent discussion and the often constructive criticism that emanated from the throngs continuously pressing about the displays of stripped chassis. It is unquestionably true that the automobile has developed in America a generation of mechanics, men who have at least a fundamental understanding of "what makes the wheels go 'round." While the increasing trend toward closed cars brings corresponding interest in body lines, upholstery fittings, finish and appointments, there can be no serious doubt as to the earnest, intelligent appreciation of the mechanical side of the motor car on the part of the show patrons.

There is no difference of opinion about the wearying, nerve racking effect of show week. It is hard work. Is it not a fact that because when we take our work seriously it is so hard to go through show week, we are inclined to lend a willing ear to the suggestion that it is not worth while? My thought is that if we are losing our enthusiasm we ought to step aside and give place to youngsters who can stand the gaff.

I am in thorough accord with the idea that it is unnecessary to resort to cabaret performances and to other frolics to promote legitimate motor car business. But in considering these happenings of show week, we must remember that they are in no sense any part of the show. The show must not be held responsible for them and must not be asked to shoulder any criticism that justly may be directed to them.

E. A. TRAVIS,
Locomobile Company of America, Inc.

Demand Present for Big Engines

Editor, AUTOMOTIVE INDUSTRIES:

We wish to express our full accord with the editorial in your issue of December 28 on the subject of big engines. It is probably true that the demand for engines of this size will never run into any immense quantities such as our larger engine producers are accustomed to expect. On the other hand, there is a very substantial demand for large engines of modern design and capable of withstanding continuous heavy duty service. Speaking from our own experience there is a very decided demand for engines up to 150 actual, everyday, usable horsepower for use in motor railway coaches. Whenever an engine of this size can be produced and proven out as satisfactory in heavy duty service, it will open up an entirely new field for railway cars for railroad service.

There are many local train schedules where the requirements are too severe for the present type of motor coach but where nevertheless the steam train is operated at a loss. Under such conditions the properly designed motor coach propelled with an engine of approximately 150 hp. will undoubtedly furnish the solution.

There is also a considerable demand for engines of this type from gasoline locomotive builders and various other sources such as builders of gasoline shovels, ditching machines, electric stand by power plant, pumping stations, portable air compressor outfits and numerous similar applications.

The manufacturer who can produce a high grade engine of this size and type manufactured on an interchangeable basis and sufficiently rugged in design and thorough in cooling and other features so as to stand up under practically wide open throttle operation, will be able to sell these engines at a reasonable price for the services indicated.

Permit us to compliment you on having the forethought to call this to the attention of the trade in your editorial columns.

CHARLES GUERNSEY,
Service Motor Truck Co.

THE Laduna gasoline gage is manufactured by the Laduna Co., not by the Sokoma Co., as was incorrectly stated in AUTOMOTIVE INDUSTRIES of Feb. 15.

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A Warning Signal Hoisted

AN increase from 4 per cent to 4½ per cent in the rediscount rate charged by the New York and Boston Federal Reserve Banks is one of the most significant events of recent months in financial circles. While a reassuring statement was made in connection with the announcement, the action undoubtedly was taken to check a strong tendency toward industrial over-expansion.

So far as financial conditions are concerned, they cannot be compared with those which prevailed in the spring of 1920 when banks began the process of deflation. At that time almost everyone was borrowing money for speculative purposes. It must be remembered, however, that little heed was given to the preliminary warning signals hoisted early in the spring of that year.

Many keen observers feel that the business and industrial machinery of the country is moving too fast. Prices of all commodities are strong and many of them have been rising slowly for months. Unless caution is exercised, the result will be a runaway market which inevitably will bring a cessation of buying by the consuming public.

Steel manufacturers complain that some of the important factors in the automotive industry are paying premiums for immediate delivery of certain kinds of steel, just as they did in 1919 and part of 1920. This bidding against each other for supplies is a dangerous practice.

While factories in all lines are operating close to capacity, there are indications here and there that retail selling has been slowed up by higher prices. It also is true that wholesale buying has been made hesitant by price uncertainties. Such reactions cannot fail to have harmful effects.

There is nothing in the air to occasion pessimism, but there are many indications that caution is advisable and will become increasingly so as mid-year approaches. The automotive industry will be wise if it applies the lessons learned in 1920 and is prepared for any possible eventualities notwithstanding the fact that it is assured of having a good year in every way.

"Alibis" in Production

"THE biggest manufacturing problem today is that of taking the alibis out of production," said a prominent automotive executive recently. "It is not so hard to remedy production inefficiencies," he continued, "if you can determine specifically where responsibility for them lies. The difficulty is in so adjusting your organization that the opportunity for 'passing the buck' is reduced to a minimum."

Such adjustments have to be made from both the mechanical and the human standpoint. Inspections can be so placed as to localize responsibility for error. Cost accounting methods can be revamped to give a more accurate and detailed picture of unit costs. Mechanical operations can be laid out in such sequence that the exact source of inefficiency can be more readily discovered.

The individual responsibility of the foreman can be increased. He can be held accountable for certain results. He can be made to understand that responsibility and to take pride in it. To accomplish these ends, working under a staff type organization, the foreman will have to get cooperation from men who are coordinate or superior to himself in authority. He will need certain abilities that have not always been considered necessary in a foreman. But the development of foremen with such abilities makes for the highest production efficiency over any long period of time.

The plan of increasing the necessity for judgment on the part of the individual, both foreman and worker, is in direct opposition to that of centralizing responsibility by making the activities of foreman and workers as nearly mechanical as possible. The educational work necessary for building an organization of this character is not so great as to be outside the scope of any company.

Fire Hazards in the Patent Office

THOUSANDS of patent papers, many of them of great value to the automotive industry, are stored in Washington under conditions of extreme fire hazard. Kept in open wooden shelves on mezzanine tiers of the top floor of the Patent Office building, irreproducible file wrappers of applications for patents are constantly in danger of being swept away by fire. The building is built around an open court. The galleries in which file wrappers are stored are literally miles in length. The building itself is fireproof, but flames, once started, would readily sweep through the long corridors filled with paper on wooden shelving and clean out the interior.

Fire doors are provided only at the four corners. A blaze once started could be confined to one very long corridor at best. A sprinkler system is in use but probably would have material effect only on the top tier of shelves.

Printed copies of patents, in addition to the file wrappers, are stored in these sections. The printed copies might not be difficult to replace if they should be destroyed, but the file wrappers could not be replaced at all in most cases. Only two copies of these wrappers exist, one in the patent office and the other in the hands of the inventor or patent lawyer. They contain the real history of the patent necessary to a proper discussion of any questions that might arise.

In 1877 a fire did clean out many valuable records. File wrappers of patent applications made before 1877 have not been available since.

A bill has recently been introduced in Congress calling for the appointment of a special committee to investigate conditions in the patent office in respect to fire hazard. The investigation should not take more than a few hours.

Several solutions to the problem might be offered. It has been proposed that a special structure be erected in the court of the patent office building, properly equipped with fire-proof boxes to take care of these valuable records. This does not seem feasible since it would shut off much of the light from the building as it now stands and would be out of line with the architecture of the building. A more practicable plan might be to excavate under the court and provide fire-proof vaults there. Part of this work has been finished already, since there are a number of small vaults under the court at the present time. Many years ago these were used for wood storage, when the building was heated by burning wood.

One-third of all the patents granted during the last 17 years relate directly or indirectly to the automobile and its manufacture. During these 17 years about 600,000 patents have been granted; 200,000 of them have related to the automotive industry in one way or another. The automotive industry is vitally interested in the proper preservation of patent records.

M. A. M. A. Business Gained 31 Per Cent

Value of Sales in January Totaled $45,451,950—Improvement in Collections

NEW YORK, Feb. 26—Indicative of the movement among motor vehicle producers to sustain production on high schedules is the report of the Motor and Accessory Manufacturers' Association showing that during January sales of parts to car and truck manufacturers amounted to $45,451,950, an increase of 31 per cent over the previous month, and proving more than twice as great as the business transacted by its members in January of 1921.

Collections reflect excellent conditions among parts purchasers, past due accounts having been reduced 29.33 per cent from December which, in turn, reported a substantial decrease from November. The receipt of orders is pressing the parts makers toward capacity operations, present business being regarded merely as a forerunner of what may be expected as production schedules among car builders mount to peak proportions.

Programs at car producing plants now are in advance of those followed in January, when output totaled 221,679, although on account of the fewer working days, February is not likely to equal that figure.

Retail Buying Continues Active

Retail buying continues active with further expansion of sales noted as automobile shows reach out to cover the entire country. Dealer attendance is one of the chief features of the exhibits in distributing centers, and evidences the extent of car interest among the smaller communities. On the basis of orders taken at the shows and the general trend toward increased buying, car makers are scheduling output that with some of the major producers should reach plant capacity next month.

While closed models maintain a strong hold among sales, approaching spring has stimulated the demand for open models. Dealers are absorbing the output of the latter type, partly for current business, but to a large extent to be in readiness for the anticipated seasonal demand.

For the same reason there has been a somewhat better tone in the truck branch of the industry. The January output of 19,206 was approximately twice as great as that for the same month of last year, and from now on a pronounced forward movement of schedules may be expected. With new fields opening up and conditions not only in business centers

(*Continued on page* 541)

Business in Brief

NEW YORK, March 1—Commodity prices have made a very distinct rise all along the line with few exceptions. Soft coal and some grains have weakened in price. Retail trade has not kept pace with industry, but much of this is due to weather conditions.

Prices of iron and steel have increased again. Railroads continue to place heavy orders for locomotives and cars, and implement and automotive manufacturers are buying steadily. Iron and steel trades continue to complain about the shortage of labor, which is retarding capacity production.

Building operations have continued at a high level with weather conditions as the regulating factor. Plans for enormous amount of construction go on apace and will depend largely on supply of labor and materials.

Car loadings for the week of Feb. 10 aggregated 853,289, a decrease of some 12,000 from the week previous.

The stock market showed a general upward trend. Reports of commercial activity, increased prices and prospects of greater earnings caused renewed buying for speculative purposes. Bonds were somewhat irregular. Sterling advanced to a new high.

Raising the rediscount rate from 4 to 4½ per cent by the Federal Reserve Banks in New York and Boston was by far the most important event in the money market. This leaves San Francisco the only district still maintaining 4 per cent. The move is generally regarded as one to equalize borrowing and to curb tendencies toward speculation and inflation.

Owen Dyneto Production to Be Increased March 15

SYRACUSE, Feb. 28—Increased production of starting and lighting systems at the Owen-Dyneto Corp. is to be started March 15, when production is scheduled to reach 250 sets a day, to be increased later to 500. James D. Grant, manager of the company, made the announcement that additional space for manufacture permits increasing the production schedule. A new system of progressive assembly of the starting and lighting systems has been installed at the plant.

Owen and VerLinden May Bid for Liberty

Both Have Definite Plans If They Acquire It—Sale of Plant Scheduled for April 3

DETROIT, Feb. 28—The plant and property of the Liberty Motor Car Co. will be sold at public auction April 3 by an order issued to the receiver this week in the United States District Court. The order specifies that the minimum acceptable bid is $1,175,000, and that the successful bidder must deposit a certified check for $10,000 on acceptance.

The financial statement of the company lists assets at $1,673,535 and liabilities $1,601,262, exclusive of stock.

From well informed sources there appears at this time the possibility of two responsible bidders for the property, one headed by Percy Owen, president of the present Liberty company, and the other by Edward VerLinden, president of the Olds Motor Works during the Durant régime in General Motors and later identified with the Durant Motor Co. of Michigan as president.

If Owen enters the field as a bidder he will be backed by New York capital, the sources of which he has been negotiating with for over a period of several months. VerLinden will have the backing of a group of persons in the financial and parts manufacturing field, who, it is declared, will be in a position to give the company all the backing necessary to establish it strongly.

No matter which group takes over the property, it is certain that the product will undergo a complete change. The Verlinden plan is understood to provide for the manufacture of a light six car which would sell in the $1,000 price class. This car has been fully developed by VerLinden and investigations of the market have led to the belief that 30,000 could be built and sold in the first year of operation. Owen's plans also call for a new line.

Clark Concentrates Axle Production at Buchanan

DETROIT, Feb. 26—The Clark Equipment Co. is concentrating axle manufacturing at Buchanan, Mich., by the removal of equipment from its Battle Creek plant, and will devote the latter factory to the exclusive production of its truc-tractor, a gasoline-operated industrial factory truck.

The Battle Creek plant was occupied only partly in axle manufacturing, the main production being at Buchanan. The change will permit not only of economies through concentrating axle operations in one plant, but also of expansion of the truc-tractor business which is reported to be growing more rapidly than Buchanan facilities could meet.

Janesville Factory Now in Production

First Chevrolet Shipped — Plant Becomes Active Assembling Unit of G. M. C.

JANESVILLE, WIS., Feb. 24—Delivery has been made of the first Chevrolet automobiles produced here in the factory erected four years ago by the General Motors Corp. for the Samson Tractor Co. These cars, three phaetons and three roadsters, went to the local Chevrolet dealer.

Thus is under way the transformation of the huge tractor plant, built at a cost of millions of dollars, operated for a brief period for the purpose for which it was intended, and then allowed to lapse into idleness, from a costly liability of General Motors into an active assembling unit of the Chevrolet Motor Co., in which the ultimate construction of upward of 4500 cars a month is planned.

Plant Turned Over in November

It was last November that General Motors turned the plant over to its Chevrolet subsidiary. Up to that time the plant had been occupied by the Samson Tractor Co., although for a number of months operations had been practically at a standstill. The Samson business was moved into the quarters of the Janesville Machine Co., also a General Motors subsidiary, and in the weeks that followed remarkable progress was made in re-equipping the plant for the production of automobiles.

A part of the plant was turned over to the Fisher Body Corp., for the manufacture of enclosed bodies for Chevrolet cars. Manufacturing preparations are under way in this unit, and it is expected that the production of bodies will begin about March 1. Meanwhile all the cars produced are of the open type.

Practically all materials required for March production schedules of both the Chevrolet and Fisher factories have been delivered at Janesville. In the past week more than 120 carloads of freight were checked in. J. A. Eggert, chief construction engineer who supervised the remodeling of the old Samson tractor plant and erection of a new assembling unit for the Chevrolet works and the new Fisher body factory, has gone to Buffalo to take charge of the extensive construction work which General Motors has started at that point for both Chevrolet and Fisher divisions.

Producing 25 Cars Daily

The first car came from the production line Feb. 14. Today production is at the rate of twenty-five cars a day. Plans call for the production of 2500 cars in March, and officials hope by the first of May to be producing at the rate of 175 cars a day. When this point is reached, the Janesville plant will be one of the large assembling units of Chevrolet. The output of this plant will go largely to the Northwest. The first shipment by rail was four carloads to Minneapolis. The Chevrolet parts department maintained in Chicago will be moved to Janesville.

The factory and executive personnel is being rapidly built up. T. E. Houghton

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Use of Truck to Meet Greater Transportation Needs Looked Upon with Favor in Foreign Countries

By WARD W. MOHUN,
Export Manager of the Federal Motor Truck Co.

Detroit, Feb. 28.

MOTOR buses are pioneering the way for American motor truck business in practically all parts of the world today, to such an extent in fact that practically one-half of the motor truck chassis now being exported are designed for passenger transportation.

It is the experience of motor truck builders that the buses first employed in the carrying of passengers develop gradually a freight carrying business that presently requires the employment of more trucks to meet transportation needs that formerly were scarcely known to have existed.

In almost all countries outside of the United States the railroads are governmentally operated, a condition which would seem to predispose toward antagonism to truck progress. In almost every case the opposite situation prevails. Rail extensions are regarded as extremely expensive and for that reason are discountenanced. The use of trucks to meet growing transportation needs is not only favorably regarded but in many instances is directly encouraged by development of roads.

In this connection Japan is doing notable work. New roads are being extended to many parts of the empire, in the building of which trucks are having an important part. When completed the way will be thrown open for the sale of greatly increased numbers of both cars and trucks.

Investigation of highways is an important feature of the development of truck markets abroad. Most of the highways are not built to stand heavy traffic and as a result truck weights are limited. In the Scandinavian countries there is a good market for trucks up to two tons, but no trucks heavier than that are permitted unless equipped with pneumatic tires. Successful business can be built up where intelligent study is given to the highways.

Experience has shown the value of confining the export trade to the bare chassis as far as possible, and the encouraging of home industry in the building of bodies and cabs. American production methods have given us an edge on prices which preferential tariffs are unable to overcome. By selling chassis only this price advantage is most pronounced. Furthermore, it makes for lower shipping costs both to point of export and ocean freight and reduces tariffs. With all chassis, however, we provide blue prints to help the dealer and buyer in adapting the body to the frame.

The question of service parts is not as important in export business generally as in domestic business, because most of the large foreign dealers have fully equipped machine shops in which they duplicate parts at low cost. In some countries, however, dealers prefer to carry parts stocks and for the most part do this very completely.

We regard it as an important part of the truck company's export plan to mail copies of its financial statements and reports to banks in all important export centers. This has been found to benefit dealers to a large extent in making necessary credit arrangements.

Standard Parts Rushing Production at Pontiac

PONTIAC, MICH., Feb. 27—Rush production in the Pontiac spring plant of the Standard Parts Co. has been ordered, according to B. A. Litchfield, general manager. Litchfield says that immediate expansion is being undertaken and a new unit of the plant has already been started, but that delay in getting materials is causing some difficulty.

Impending sale of the Standard Parts Co. on March 29 under the receivership is having no effect locally, Litchfield states, and business is going ahead without being deterred by that condition.

Belt Line Railroad Is Assured Pontiac

PONTIAC, MICH., Feb. 28—Final steps assuring construction of a belt line railroad around the northern part of Pontiac, opening a new industrial district, have been taken, and right of way has now been secured up to the site of the new Fisher body plant, which will be started this spring. The assurance of a belt line was the only condition attached to Fisher's announcement of its plans for building here.

Preliminary work on the Fisher plant has been started, and plans are now nearly completed. It is announced that work will be started on construction early in the spring, and that the plant, which will have 300,000 sq. ft. of floor space, will be in operation in August, according to present plans.

Grand Trunk officials have pledged construction on the belt line this year as far as the Fisher site.

Studebaker Reports Profit of $18,086,195

Equivalent to $29.02 a Share Earned on $60,000,000 Common Outstanding

SOUTH BEND, IND., Feb. 26—A net profit of $18,086,195, after depreciation and Federal taxes from net sales of $133,178,881, was made last year by the Studebaker Corp., according to the annual report of the company just issued. Actual sales of 110,269 cars in 1922 exceeded the 1921 record by 65½ per cent and 1920 by 144 per cent.

This showing, after preferred dividends, is equivalent to $29.02 a share earned on $60,000,000 common stock outstanding practically all through the year, and to $23.21 a share on $75,000,000 at the end of the year, which included the 25 per cent stock dividend payable on Dec. 29 to shareholders of record Dec. 16. The net profit in 1921 was $10,409,690 or $16.20 a share on $60,000,000 common stock outstanding Dec. 31, 1921.

Income Account Prepared

The 1922 income account compared with the preceding year is as follows:

	1922	1921
Net sales	$133,178,881	$96,690,643
Exp., deprec., etc.	113,134,924	84,158,347
Net earned	$20,043,957	$12,532,296
Other income	615,135	138,149
Total income	$20,659,092	$12,670,445
Federal taxes	2,572,897	2,260,755
Net profit	$18,086,195	$10,409,690
Preferred dividends	673,760	686,000
Common dividends	6,000,000	4,200,000
Surplus	$11,412,446	$5,523,690
P & L surplus	*$10,237,189	$14,220,743

*After provision for $15,000,000 stock dividend and transfer of $405,000 to special surplus account.

The company's balance sheet as of Dec. 31 last showed current assets of $34,663,106. This compared with accounts payable of $6,756,635, reserve for Federal taxes $2,690,464, and sundry credits of $5,349 046. Current assets included cash of $15,174,396 compared with $8,334,800 at the end of 1921. Investments jumped from $2,178,170 to $4,017,991. Inventories were valued at $21,514,249 compared with $22,209,885 at the end of the previous year.

Plan 35,000 Cars This Quarter

"We are planning to produce in the first quarter 35,000 cars, compared with 26,665 last year and 10,983 the previous year in the same quarter," says President A. R. Erskine, in making his report. "The management believes that business for the year as a whole will show a substantial increase over that of last year."

The activities of the Studebaker Corp. in the twelve years it has been operating under that title as manufacturer of automobiles is given in the report. Expressed in statistical form as of Dec. 31, 1922, as compared with Jan. 1, 1911, the story is as follows:

Total sales for the twelve years were $756,505,655.73, from which net profits and other income amounted to $82,875,097.27, or 11 per cent of said sales.

Disposition of net profits: Preferred dividends, $9,361,170; common dividends, $23,934,080; surplus adjustments, $4,887,657; surplus invested in plant additions, inventories and working capital, $44,692,189, or 53 per cent, $3,000,000 of which has been permanently capitalized by so-called stock dividends.

Actual net assets, $79,334,912, as compared with $23,692,723, an increase of $55,642,189, or 234.8 per cent.

Plant and property investment, $43,426,181, as compared with $9,811,990, an increase of $33,614,191, or 342.6 per cent.

Increase in Working Capital

Net working capital, $34,348,803, as compared with $13,880,733, an increase of $20,468,070, or 147.5 per cent.

Average number of employees, 17,663, as compared with 8027, an increase of 9636, or 120 per cent.

Number of dealers, 5000, as compared with 1500, an increase of 3500, or 233 per cent.

Seven per cent cumulative preferred stock outstanding, $9,450,000, as compared with $13,500,000, a decrease of $47,068,400, or 169 per cent.

Common stock outstanding, $75,000,000, as compared with $27,931,600, an increase of $47,068,400, or 169 per cent.

Total fresh capital received by the corporation in twelve years from sales of common stock, less retired preferred stock, $13,018,400.

Estimated number of Studebaker cars now in operation, 400,000.

Subsidiary companies are the Studebaker Corp. of America, South Bend; Studebaker Corp. of Canada, Ltd., Walkerville, Ont.; Studebaker Bros. Co. of Utah, Salt Lake City, and Studebaker Do Brazil, Rio de Janeiro.

CASE SHIPS TRACTORS FOR AUSTRALIAN USE

RACINE, WIS., Feb. 26—Indicative of the improvement in the tractor and tractor implement business, domestic and export, is the fact that the J. I. Case T. M. Co. of Racine, Wis., during the past week shipped to Australia one of the largest individual consignments of merchandise on record.

It consisted of thirty solid carloads, including 100 Case tractors, twenty Case Six cars and a varied assortment of Grand Detour plows and disk harrows, silo fillers, steam engines, road building machinery and other products.

One car was loaded with repair and replacement parts. A trainload of Case goods, somewhat smaller than this one, was shipped to Australia earlier in the winter.

Fisk's 1922 Profits Reached $1,655,075

In 1921 Company Reported $6,398,469 Deficit Due to Inventory Losses

NEW YORK, Feb. 26—Reporting net profits of $1,655,075 for the year ending Dec. 31, 1922, H. T. Dunn, president of the Fisk Rubber Co., has advised stockholders that the plants of the company now are operating at close to capacity and that present business and orders for spring delivery are considerably in excess of a year ago.

The company's annual statement, just issued, shows that the net profits before deduction of interest and other charges were $3,157,462 against $3,366,467 in 1921. After deductions, the total of $1,655,075 is reached, which compares with a loss of $6,398,469 in 1921, occasioned partly by losses in inventory in 1921 over 1920 which was accumulated at the high prices prevailing in that year. The profit and loss surplus on Dec. 31, 1922, was $3,528,493 against $1,873,417 at the end of 1921.

Current Assets, $25,098,620

Current assets total $25,098,620, with $2,495,733 as cash in banks, on hand and in transit, while current liabilities amount to $7,149,911, with $5,200,615 as reserves, $4,711,526 for depreciation, $120,000 for insurance liability assumed by the company and $369,088 for contingencies.

The current assets and current liabilities are as follows:

Current Assets:	
Inventories	
Rubber and fabric	$2,238,525
Materials and supplies	1,735,875
Work in process	872,310
Finished stock	8.674 078
	$13,520,790
Accounts receivable, less reserves	
Trade	$7,637,784
Others	221.675
	$7,859,459
Notes receivable	
Trade	611.730
Others	610 907
	$1,222,637
Cash in banks, on hand and in transit	$2,495,733
Total current assets	$25,098,620
Current Liabilities:	
Loans payable	$5,135,000
Account payable	1.761.578
Accrued bond interest	253,333
Total current liabilities	$7,149,911

NASH SALES DOUBLED

KENOSHA, WIS., Feb. 24—Shipments of Nash cars from the factories in the first month and a half of this year were equal to the total shipments for the first three months of last year, according to E. H. McCarty, sales manager. Total sales of Nash cars in 1922 were 40,000, McCarty said, as compared with 20,000 in 1921.

Recognition Given Finance Companies

Federal Reserve Board Reports They Hold Place in Banking Organization

WASHINGTON, Feb. 27—An extensive study of finance companies, especially those engaged in the wholesale and retail automobile field, is published in the January issue of the Federal Reserve Bulletin, issued by the Federal Reserve Board.

Justification for the existence of these companies is contained in the concluding paragraph, where it is stated that "they are enabled to supplement our commercial banking system and to make for themselves a distinct economic position in our financial organization."

Discusses Phases of Work

The article deals with the two phases of the automotive financing business:

(1) Advances made to assist the dealer in securing cars from the manufacturer, and

(2) Accommodation enabling the dealer to sell on the installment plan without the necessity of keeping his own capital tied up and so limit his operations.

The writer of the article admits the lack of reliable statistics showing accurately the proportion of sales made on the installment plan, but he states that the estimates of authorities vary from 50 to 70 per cent of the total cars sold.

It is stated that the charge of automobile finance companies as a general rule approximates 15 per cent on the funds outstanding. The percentage of past due accounts, it is stated, ranges from a fraction of 1 per cent to 15 to 20 per cent, but that the percentage of the total number of cars financed which it is necessary to repossess is very low, in most cases not more than 1 per cent.

Character of Risks Taken

Discussing the economic position of finance companies, the article says:

Their business has tended more and more to resemble the practices of commercial banks. The relation between the two closely resembles that between cattle loan companies and banks.

There are in the United States a vast number of companies and individuals whose resources, or apparent credit risk, do not measure up to the standard required by banks. It is largely these that the finance company is called upon to finance. It does not necessarily follow that such subjects are not good credit risks, but merely that in so far as the bank is able to investigate they do not fulfill the usual requirements.

In addition, payments of the loans made to this class may be spread over a longer period than that for which a commercial bank will advance funds. The payments, too, are probably in small lots, such as installments, which must be carefully watched and rigidly collected when due.

Collateral offered as security is in small lots, such as a group of small accounts receivable. As a result, commercial banks find this class of business unprofitable at the usual rates of interest. If they charged more it would lead to legal difficulties in some cases, and nearly always to dissension among those borrowers who have to pay the higher rate.

Finance companies, however, by dealing only with this class of customers can charge more without causing dissatisfaction among customers. This increased income enables it to carry the investigation further and to protect itself in making a loan, and also to watch developments after the loan is made. In short, finance companies are an intensified part of our commercial banking system.

FORD HINTS INCREASE IN PRICE IN CANADA

DETROIT, Feb. 28—Ford Motor Co. of Canada, Ltd., is advertising in Canadian papers that its salesmen have been instructed to call upon every family in the Dominion so that everyone who wishes to buy a car at the present low figures may have an opportunity to do so.

The advertisements declare that the tendency is toward increased prices and urge that all prospective purchasers protect themselves by placing orders for cars at once.

Oshkosh Debts Reduced 33 1/3 Per Cent in 1922

OSHKOSH, WIS., Feb. 26—At the annual meeting of stockholders in the Oshkosh Motor Truck Co., reports indicated that indebtedness was reduced 33 1/3 per cent during 1922, despite the unfavorable conditions still surrounding the commercial vehicle industry.

January sales exceeded those of the same month in 1922 by 140 per cent, indicating that 1923 prospects are even better in comparison with the depressed period of 1920 and 1921.

The number of finished trucks on hand has reduced to a fair average, and ample finances have been assured to make regular production possible for the remainder of this year. A sales organization of sixty-six dealers has been built up in all parts of the country.

Briscoe Devices Expands Due to Increased Orders

PONTIAC, MICH., Feb. 28—Enlargement of the force employed at the Briscoe Devices Corp. plant here has resulted during the last few days from increased orders for carbureters and parts turned out by the concern. The principal business thus far has been the manufactgure of carbureters, but other products added to the line have brought large orders from Durant, Star and Gray, as well as from Ford and Maxwell.

The company is now manufacturing choker assembly parts and steering wheel sector parts. Delivery of 35,000 parts for the Star during March and 15,000 for the Durant have been contracted for, according to Emil D. Moessner, treasurer.

Yellow Cab Increases Tire; Reduces Wheel

Adopts 20-In. Rim as Stock Equipment—New Model of Vehicle Announced

CHICAGO, Feb. 26—The Yellow Cab Manufacturing Co. announces the adoption of the large oversize tire and the small diameter wheel as stock equipment of its cabs. The size selected is a 20 in. rim, either Disteel or Budd type of wheel, with 29 x 4½ or 30 x 5 in. Firestone or Goodyear tire.

This change in equipment is made only after thorough tryouts on the 1600 cabs the company operates in Chicago. The company claims that the tests have proved so satisfactory that the adoption of the new sizes means that the Yellow cabs can be operated at less cost per mile than the average citizen can operate a phaeton.

Decreasing the wheel size and increasing the cross section diameter of the tire decreases unsprung weight, it is claimed, and makes for improved riding qualities. Gasoline consumption on cabs using the oversize tire has been decreased, and from three to five miles per gallon more mileage have been secured not only in tests with Yellow cabs but also with passenger cars, it is asserted.

Less Wear and Tear Claimed

"With the new type," says the company in announcing the change, "there is less wear and tear on the tires, while the danger of skidding, even without chains, is particularly nullified. An additional advantage is the ease with which sand and mud can be negotiated. In the tire size, as created, the air pressure is less and the life is longer."

The company finds that on a 20 in. rim the follow tire sizes will fit: 29 x 4½, 30 x 5, 32 x 6 and 34 x 7.

At the same time the company announces a new model, the 2 A Yellow cab, which will sell at $1,950, which is $300 less than the older model. It is 800 lb. lighter and changes have been made in the springing and braking. In merchandising this new model, the purchaser pays $300 down and has two years in which to complete his payments.

It is said that the company has decided to eliminate all agents from now on and sell direct.

TOAZ ADDRESSES S. A. E.

DAYTON, OHIO, Feb. 28—According to Glenn A. Toaz of the Steel Products Co. valve development has recently made rapid strides. In his paper presented before the Dayton Section of the Society of Automotive Engineers, Toaz showed how valve manufacturers by their use of special alloys had more than kept pace with the increasing severity of heat conditions due to slower burning fuels, increased compressions and higher mean effective pressures.

U. S. Chamber Gets Trade Body Report

Propositions Will Now Be Submitted to Membership to Be Voted Upon

WASHINGTON, Feb. 27—Disapproval of Government control of trade associations is expressed in a report submitted by a committee of the Chamber of Commerce of the United States which has been making an investigation of association work. Alfred Reeves, general manager of the National Automobile Chamber of Commerce, represents the automotive industry on the committee.

Data contained in the report will be the basis for a referendum vote by the membership of the Chamber.

Referring to statistical activities of association, the report states:

Trustworthy information concerning capacity, production, stocks, sales and prices is essential to the effective operation of industry and trade under competitive conditions. The voluntary reporting of such information to trade associations and the subsequent publication or dissemination of such information in a manner which makes it available not only to contributors but also to consumers and to the public generally is beneficial alike to the field of business and the public and does not constitute a restraint of trade.

Membership to Voice Attitude

The membership of the Chamber will define its views on association activities through the following propositions which will be submitted to a vote:

Because of numerous useful and important functions of obvious propriety, trade associations should exist for each important branch of industry and commerce.

A trade association should have such a membership that it can be representative of the industry in connection with problems affecting the general advance of the industry.

A trade association should be prepared to consider all problems affecting the general advance of its industry or branch of commerce.

Trade associations should continue free from special forms of government control.

Statistics of capacity, production, stocks and sales should be collected by a trade association for its industry or branch of commerce.

Statistics of actual prices in closed transactions should be collected by a trade association for its industry or branch of commerce.

ATLANTA BANKS UNITE IN LAUDING INDUSTRY

ATLANTA, Feb. 26—In the automobile show sections of the three Atlanta papers on Sunday, Feb. 18, during the holding of the annual Southern Automobile Show, the leading Atlanta banks published a cooperative advertisement expressing their whole-souled confidence in the stability of the automotive industry.

This advertisement was headed "Changing the Outlook of a Nation," and traced the development of the industry from 1903 to the present date, showing what the automobile has done for the South and for the nation.

"The motor car has increased the South's educational and religious facilities and given every farmer a nearby market," another subheading stated, and then went on to show how this has been accomplished, why the automobile has become an economic necessity.

"The banks of Atlanta are glad of this opportunity to commend the spirit that has made the Southern Automobile Show possible," the advertisement concluded.

Banks cooperating in this advertisement were the Atlanta National, Fulton National, Citizens' and Southern, Fourth National, Lowry Bank and Trust Co. of Georgia and the Atlanta Trust Co., six of the largest financial institutions in the South.

Elgin Stockholders Get Time for Reorganization

CHICAGO, Feb. 28—An extension of time to permit a committee of stockholders to attempt reorganization of the Elgin Motor Car Corp. was granted today by the referee in bankruptcy before whom a hearing was scheduled by order of the United States District Court.

Bids for the assets of the bankrupt company were advertised for last week but none was submitted. The trustee asked for permission to sell the property at auction, but the stockholders' committee, headed by C. S. Reiman, president of the corporation, declared that a plan of reorganization was under way which gave evidence of success. Members of the committee requested for more time and at today's hearing they paid to the trustee $2,500 to cover the cost of maintaining the plant for thirty days. The next hearing will be March 28. No details of the reorganization plan were made public.

Rickenbacker Completes Equipping New Addition

DETROIT, Feb. 27—Rickenbacker Motor Co. has completed the equipping of its new factory addition, and the production line will now be extended the full length of the new and old plants. With the addition the company will have a capacity for about fifty cars daily and is expected to reach this manufacturing pace next month.

March will witness the fifteenth month of production at the plant. The company reports a steady enlargement of both its factory force and dealer organization. Manufacturing plans contemplate the continuance of specialization on the three models which the company is now building.

House Votes Funds for Rubber Survey

Appropriates $500,000 for Investigations in Latin America and Philippines

WASHINGTON, Feb. 26—The House has approved the item in the third deficiency bill appropriating $500,000 to permit the Department of Commerce to investigate the rubber-raising possibilities of Latin America and the Philippines with the view of inducing the investment of American capital. The approval was given without a dissenting voice.

Government Officials Testified

WASHINGTON, Feb. 27—Testimony of Secretary of Commerce Hoover, Secretary of Agriculture Wallace and other Government officials before the House Appropriation Committee, as made public today, shows the vital need of an assured supply of crude rubber. All Government officials are unanimous in the opinion that the expansion of the automobile industry in the next few years will require large increases in rubber production.

Secretary Hoover declared that in the progress of rubber consumption in this country it will be necessary to increase the world's production by 50 per cent within the next ten years, in order to accommodate our own needs.

He pointed out that the entire rubber-consuming industry is in agreement that America should stimulate, if possible, the production of rubber in South America and the Philippines, and said that the large manufacturers of rubber products have agreed to enter at once into the development with large capital. Mr. Hoover informed the committee that the automobile industry is the largest consumer of rubber, now using about 80 per cent of the total supply in this country. Chairman Madden of the appropriation committee estimated that 60 per cent of the world's total consumption of rubber is used by the American automobile industry.

Secretary Hoover said that the appropriation of $500,000, which had been asked of the committee, would be used to conduct an inquiry by experts.

Takes Up Technical Side

The technical side of investigating sources of crude rubber was explained to the committee by Dr. Cook of the Department of Agriculture.

In a memorandum submitted to the committee, Dr. Cook states as follows:

Rubber development must keep pace with growth of automotive transport. There is no indication that the saturation point for automotive development in the United States has yet been reached, as a glance at the production figures for recent years will prove. In foreign countries the war retarded normal

(*Continued on page* 544)

Milwaukee Industry Shows Onward Trend

Bank, in Monthly Review, Reports Gratifying Conditions Existing There

MILWAUKEE, Feb. 26—A most gratifying condition in the automotive industries of Milwaukee and vicinity is disclosed by the monthly review of the business situation by the commercial service department of the largest bank in Milwaukee. It says in part:

"The net increase in the number of persons employed by forty-eight of the largest firms in Milwaukee County in the past month was 2226, or 4.4 per cent. This result is surprising for the season of the year, and is good evidence of the vigor of industrial expansion. The largest percentages of increase occurred in metals and metal products other than iron and steel, automotive lines and iron and steel products. The gain in the iron and steel industry was well distributed among the firms from which reports were received." It then proceeds to say:

Firms manufacturing automobile parts and accessories made exceptionally good gains. A firm in the farm implement line took on about 200 additional men. A company making tires and other rubber products increased its working force by 240 people.

Business in motor trucks appears to have made a substantial gain. One motor truck concern is operating at 88 per cent of capacity, compared with 44 per cent a year ago. A concern making engines is operating at treble the capacity of last year at this time. Its unfilled orders are twice as large and sales for the past month increased 75 per cent.

Sales for spring delivery on the books of local dealers as February draws to an end are variably 25 to 200 per cent larger than they were a year ago, according to figures reported by eight of the largest dealers in Milwaukee. Much success has been achieved in closing deals with prospects gained during the annual Milwaukee show a month ago.

300 Cars Produced Daily by Durant of Michigan

DETROIT, Feb. 28—Production at the plant of the Durant Motor Co. of Michigan is reported at the rate of 300 cars a day, this to be increased to a peak of 450 by May. Of this number 25 per cent will be Durant fours and the balance Stars.

In the fifteen months of plant operation production totals are 13,500 Durants and 17,500 Stars, the latter starting in September last when twenty-four were built.

Production in January approximated 5000 in both makes and February will reach about 6000. March production will aggregate 9000. Driveways are reaching about 150 daily, with the remainder being shipped as fast as freight cars can be accumulated.

MEMBERS OF M. A. M. A. REPORT AN INCREASE OF 30.94 PER CENT IN BUSINESS

NEW YORK, Feb. 26—Reports from members of the Motor and Accessory Manufacturers Association show that sales in January, 1923, increased 30.94 per cent over the preceding month, the total purchases amounting to $45,451,950. Past due accounts were $2,469,950, a decrease of 29.33 per cent, while notes outstanding totaled $1,945,850. an increase of 2.11 per cent over December.

The following table shows the sales by members of the association, the total past due accounts and the totals of notes held for all of 1922 and the first month of 1923:

1922	Total Sales	Per Cent Change	Total Past Due	Per Cent Change	Total Notes Outstanding	Per Cent Change
January	17,320,000	20.61 Inc.	4,450,000	5.45 Inc.	3,146,000	7.02 Dec.
February	22,720,000	31.17 Inc.	4,070,000	8.57 Dec.	3,483,000	10.74 Inc.
March	28,670,000	26.14 Inc.	2,890,000	28.86 Dec.	2,657,000	23.69 Dec.
April	33,830,000	18.07 Inc.	3,000,000	2.00 Inc.	2,500,000	1.05 Dec.
May	43,700,000	28.06 Inc.	2,900,000	2.75 Dec.	2,450,000	6.05 Dec.
June	42,000,000	3.85 Dec.	2,840,000	1.25 Dec.	2,320,000	5.00 Dec.
July	41,001,670	2.42 Dec.	3,423,850	20.42 Inc.	2,217,670	4.49 Dec.
August	43,700,000	5.00 Inc.	3,705,000	8.21 Inc.	2,398,350	8.15 Inc.
September	37,300,050	13.36 Dec.	4,220,400	13.91 Inc.	2,658,800	10.86 Inc.
October	38,753,800	3.90 Inc.	3,463,850	17.93 Dec.	2,603,100	2.09 Dec.
November	36,616,850	5.51 Dec.	4,245,850	22.58 Inc.	2,442,700	6.15 Dec.
December	34,711,630	5.20 Dec.	3,494 850	17.69 Dec.	1,905,650	21.98 Dec.
1923						
January	45,451,950	30.94 Inc.	2,469,950	29.33 Dec.	1,945,850	2.11 Inc.

At the end of the first two years of operation the plant is expected to be operating on a basis of 9500 monthly.

Adams Axle Expanding

FINDLAY, OHIO, Feb. 28—Expansion of the Adams Axle Co. here will employ 100 additional men within ninety days, it is announced by President George M. Carter. This will bring the number on the payroll to 500.

A total of 30,000 sq. ft. of floor space has been added to the plant since Nov. 1. One new plant unit has been built. The company manufactures axles for the Durant car.

Business of M. A. M. A. Increased 31 Per Cent

(*Continued from page* 536)

but in agricultural districts improving, truck manufacturers will experience a marked revival in demand.

Tire production is going along on higher schedules, with prospects of exceeding the peak months of 1920. The greater output keeps pace with increased automobile and truck programs, and will cover the replacement demand which, with a greater number of vehicles now in use, will exceed that of two years ago.

Tractor plants are showing more activity with shipments gaining and manufacturers feeling the stimulus of increased buying power of the farmer.

SUCCESSOR TO GERSIX

SEATTLE, WASH., Feb. 27—The Kenworth Motor Truck Corp. has announced its succession to the Gersix Manufacturing Co., the product to be known hereafter as the K. W. truck instead of the Gersix as heretofore.

Spain Uses Greater Number of Vehicles

SEVILLE, SPAIN, Jan. 27 (*by mail*)—The rapid development of the use of motor vehicles in Spain during the last six months resulted in a gain of approximately 15 per cent in the number of such vehicles in use throughout the country. This is shown by the registration statistics for fourteen of the leading provinces as of Jan. 1, 1923, as gathered by the Royal Automobile Society of Seville.

These fourteen provinces on July 1, 1922, had a total of 30,855 automobiles, according to the figures of the society, but this number had increased to 35,196 by the beginning of this year. Based on the statistics from the remaining thirty-five provinces, as of July 1 and allowing for the probable gain in the intervening six months, it is considered probable here that the total for the country closely approximates 50,000.

Gains in Chief Cities

The chief gains, of course, were recorded in Barcelona, Madrid, Seville and Bilbao. The capital, Madrid, was credited with 8798 automobiles last July and 9580 in January. In Barcelona, the registrations rose from 8611 to 9749; in Seville, from 2450 to 2781, and in Bilbao, from 2430 to 2564.

Present registrations in the other sections from which the January registrations are available are S. Sebastian, 2512; Oviedo, 1783; Valencia, 1820; Cadiz, 994; Malaga, 925; Jaen, 745; Cordoba, 644; Badajoz, 611; Huelva, 227, and Almeria, 251.

The society also has announced that the registrations in Seville increased by 478 during the twelve months of 1922, the total being all for passenger cars, with the exception of fifty-one trucks, eleven buses and ten motorcycles.

New Mexican Tariff May Shut Out Tires

Prices of Imports Now Said to Be Prohibitive—Owners Protest to Government

MONTEREY, MEXICO, Feb. 23 (*by mail*)—With the placing in effect on Feb. 15 of a new import ad valorem duty of 85 per cent on ordinary automobile tires and 68 per cent on cord tires, the use of imported tires may be practically excluded, it is stated by dealers. The price of tires with the new duty added is regarded as almost prohibitive.

When the announcement was made recently by the Treasury Department of the Mexican Government of the increase of duties, a formal protest was made by representatives of more than 7000 owners of automobiles against the proposed changes. It was stated in this protest that it would be impossible to import and sell tires unless the duties were materially lowered.

It is learned from government sources that the chief purpose of raising the duties on tires is to encourage their domestic manufacture. It is asserted by dealers and consumers, however, that the tires of Mexican manufacture are of an inferior quality, and that they deteriorate so rapidly that in the long run they cost more than imported tires.

According to representations made to the government by tire and automobile dealers, the enforcement of the collection of the new duties will cause a paralyzation of these trades in Mexico.

Duties on Engines and Parts

WASHINGTON, Feb. 28—Dispatches received by the Department of Commerce from Mexico City state that a Mexican decree, effective March 1, levies an increase of 1.50 pesos per gross kilo as an import duty on engines for automobiles and spare parts and on bodies and frames for vehicles and separate parts whether painted or not.

Engines for automobiles formerly were admitted free of duty; bodies and separate parts for vehicles were dutiable at 0.75 pesos per gross kilo when painted and 0.50 pesos per gross kilo when unpainted.

Motor Wheel Net Income in 1922 Totaled $803,934

DETROIT, Feb. 26—The net income of the Motor Wheel Corp. for 1922 was $803,934 and gross business for the year $11,918,853, according to the report filed at the annual meeting of the company when directors and officers of the company were reelected. The surplus on hand is $1,973,899.27.

Payments for the Disteel Wheel and Forsyth Wheel properties, recently taken over, will be made by issuing $2,000,000 in unsecured gold bonds bearing 6 per cent interest. The entire issue has been purchased by the National City Co. of New York, which also bought the entire preferred stock issue of the company.

Officers and directors of the company are: H. F. Harper, president and general manager; G. S. Gier, vice-president and treasurer; O. L. Porter and W. C. Brook, vice-presidents, and C. C. Carlton, secretary. The directors include the officers and W. H. Newbrough, J. B. Siegfried, C. W. Nichols and O. Jenison.

MESSAGE ON TRACTOR BROADCAST IN WEST

CHARLES CITY, IOWA, Feb. 24—Radio broadcasting stations are being used to spread the power farming idea by Dave E. Darrah, sales manager of the Hart-Parr Co. Darrah recently gave a 30-minute address on "The Place of Mechanical Power on the Farm," which was broadcast from the Minneapolis station, through the cooperation of the Minneapolis Implement Dealers' Convention.

As a result of this address Darrah has been requested by the Sweeney Automobile School of Kansas City, Mo., to give a series of three addresses on power farming for broadcasting from its station on the evenings of Feb. 28, March 1 and 2.

Darrah has accepted and announces the following subjects for the three lectures: "Beating Back Nature's Barriers," "Let the Buyer Prepare" and "Tragedy of the Unprepared." The broadcasting will begin each evening at 6.30 o'clock on a 400-meter wave length.

In these lectures Darrah makes no mention of his own or any other individual firm.

Receivers Making Plans to Sell Perfection Tire

FORT MADISON, IOWA, Feb. 28—Paul S. Junkin and Charles C. Keedy, ancillary receivers of the Perfection Tire & Rubber Co., are making preparations for the sale of the plant, which will be carried out the latter part of March or early in April, according to present plans.

The plant will be sold subject to a mortgage of $1,000,000 due in 1931, so that the buyer will actually need only working capital above his bid figure. The mortgage, it is estimated, represents only half the reproduction value of the plant.

MILLER SALES $26,187,077

AKRON, Feb. 27—Reporting a 28 per cent increase in money volume of 1922 sales over 1921, and an increase of 131 per cent in tire units sold, the Miller Rubber Co. announces that its 1922 sales approximated $26,187,077. This figure compares with 1921 sales of $20,387,636.

Memphis Developing As Good Sales Field

Prospects Are Based on High Price for Cotton Prevailing Next Season

MEMPHIS, TENN., Feb. 28—The outlook for excellent sales of automobiles in Memphis and throughout the territory served by Memphis is bright for the spring and summer months of this year, and should be good during the fall months.

The largest single factor in the Memphis situation is the production and sales-price of cotton. During the past year the cotton crop in the territory surrounding Memphis was excellent, particularly in the Mississippi Delta and the portion of Arkansas southwest and west of Memphis. The prices obtained are a matter of record.

The prospects for a high price for cotton next season is the main basis for an opinion on the good business which should result in the fall and winter months of 1923. The low ebb of American cotton in the world, which it is estimated will reach the low mark of 2,275,000 bales by Aug. 31 of this year, and probably constitute an actual shortage before this year's crop is marketed, is worthy of considerable thought in this connection. Good production this year means assured prosperity, low production means exceedingly high prices.

Banks Report Gains

The banks of Mississippi and Arkansas and other sections served by Memphis have reported enormous gains in deposits during the past two or three months, and in some instances the high-water mark for all time has been claimed.

The building record made by Memphis during 1922 was the best of any Southern city, reaching the total of $20,883,008 for residential and commercial building. The indications for continued building operations on a large scale are good, and it is expected that the record for 1923 will be in the neighborhood of that for 1922.

As a distributing point Memphis has always held an enviable place among the Southern cities, and this year the wholesalers and other distributors located here state they expect the best spring trade they have enjoyed for a number of years, and are backing up their expectations by putting in large stocks.

Memphis ranks well up toward the front as a hardwood market, and in this line and in all lumber lines the demand for immediate shipment is ahead of any like period for the past three years. During the month of January the demand for lumber was said to be ahead of any January in the history of the industry in the South in a number of lumber producing sections.

Men of the Industry and What They Are Doing

Hayden Sails for Europe

H. K. Hayden, special representative of the automotive equipment department of the Westinghouse Electric & Manufacturing Co., Springfield, Mass., has sailed for Europe for a two months' survey on trade possibilities and service needs in connection with the company's foreign business. After leaving London, Hayden will be accompanied by E. D. Kilburn, vice-president of the Westinghouse International Co., and other members of the Westinghouse international engineering and commercial staff.

Bassick Appoints McFarland

Hayes McFarland has been appointed vice-president and director of sales and advertising of the Bassick Manufacturing Co. of Chicago, maker of Alemite lubrication systems. McFarland's promotion follows two years of successful experience as retail sales and distribution manager for Alemite products. In his new capacity, he will be responsible for greatly enlarging the Alemite sales and advertising operations in keeping with the expansion resulting from the merger of his company into the Bassick-Alemite Corp.

Handles Safety Work for Anderson

Frank Glenn has been placed in charge of the safety bureau created by the Anderson Motor Co. of Rock Hill, S. C., to assist the agencies now devoted to that work. The bureau will mail weekly stories to newspapers and will provide instructions to all Anderson salesmen so that they can instruct new buyers of Anderson cars, not only in the mechanical requirements, but also in safety driving, regulations and observance. A special instruction book on safety also will be given to each car buyer.

National Rim Appoints Wadman

Rex W. Wadman, long identified with automotive interests, has been named as vice-president and general manager in charge of sales and manufacturing of the National Collapsible Rim Corp., whose factory is located at Williamsport, Pa. The executive offices of the company have been moved to the Fisk Building, 250 West Fifty-seventh Street, New York City.

Getsinger and Fox Sales Agents

R. C. Getsinger, formerly sales manager of the Lincoln Motor Car Co., and C. L. Fox, assistant sales manager, both of whom have been identified with the sales department of the Ford Motor Co. in connection with Lincoln sales during the past year, have resigned and formed the Getsinger-Fox Co., manufacturers representatives, with offices in the General Motors Building, Detroit. They will represent the Fleetwood Metal Body Co. and the J. B. Judkins Co. in the sale of high class body work and are also working out sales arrangements with leading body, accessory and equipment companies. The new company will work in close cooperation with Detroit car manufacturers in the sale of cars with special custom bodies.

Hall Joins Howe Rubber

W. W. Hall, for six years traffic manager for the Akron Chamber of Commerce, has resigned to become traffic manager and purchasing agent for the Howe Rubber Corp. of New Brunswick, N. J. Before joining the Akron Chamber of Commerce, Howe was in charge of the eastern agency in New York of the Chicago, Milwaukee and St. Paul Railroad.

Russell with Buffalo Smelting

Henry F. Russell, formerly with the Lumen Bearing Co. and for the last five years sales manager of the iron foundry department of Farrar & Trefts, Inc., Buffalo, has been appointed treasurer and general manager of the Buffalo Smelting Co. of Buffalo.

Sullivan Returns to Oakland

W. A. Sullivan, formerly with the Oakland Motor Car Co. as assistant advertising manager, and recently identified with retail sales at Jackson, Mich., has returned to Oakland.

Kylin Made Vice-President

Oskar Kylin has been elected vice-president of the Foster Machine Co., Elkhart, Ind., manufacturer of turret lathes and screw machines. He will continue in charge of sales and engineering.

Joseph N. Smith Names Bottume

M. S. Bottume, former secretary and sales manager of C. Cowles & Co., New Haven, Conn., has become vice-president in charge of sales of Joseph N. Smith & Co., Detroit, builder of automotive hardware.

Esser Rejoins Burgess-Norton

J. G. Esser, two years ago with the Burgess-Norton Manufacturing Co., manufacturer of piston pins, and more recently with the Trindl Co. of Chicago, has returned to the Burgess-Norton company, joining its sales force. He will travel the central and western territory.

NEW YORK MAY LIMIT CABS

NEW YORK, Feb. 28—It is expected that the Mayor's Committee on Traffic, which held a session today, will recommend restriction of the number of taxicabs operating in New York City to about 14,000, the number at present in commission. This plan meets the approval of most of the cab owners.

Importers Organize and Will Hold Salon

Seven European Manufacturers Included in Foreign Automotive Association

NEW YORK, Feb. 28—The Foreign Automotive Association, an organization of importers of automobiles, has been formed for the purpose of effecting closer cooperation among the importers to the end that the foreign automobile can be presented most advantageously to the American public. Although the association is just now under way, seven European manufacturers have joined, representing Fiat, Benz, Renault, Voisin, Panhard, Lanchester and Hotchkiss.

The F. A. A., as it is already known, has opened headquarters at 150 West Fifty-seventh Street where J. C. Willcox, secretary, is located. The following officers have been elected: President, H. G. Baran (Benz); vice-president, J. H. Stelling (Voisin); treasurer, J. Vinton Locke (Hotchkiss); and secretary, J. C. Willcox (Fiat).

The organization has already secured the Hotel Astor for the staging of its first Salon, Nov. 4 to 10. It is planned to invite some makes of American cars to exhibit.

The F. A. A. membership will be limited entirely to importers of automobiles, and the total membership will constitute a board of directors. For some time the importers have felt that an organization for the consideration of their interests was very necessary.

Reeves Sees 3,000,000 Production This Year

NEW YORK, March 1—Alfred Reeves, general manager of the National Automobile Chamber of Commerce, spoke at the twentieth anniversary gathering of the West Side Y. M. C. A. automobile school last night on the "Outlook for the Automobile Industry."

Reeves predicted a production of 3,000,000 motor cars and trucks in 1923, basing his estimate on January and February production and depending on the supplies of closed bodies and plate glass. Discussing the transportation needs of 105,000,000 people, he declared that students of the industry believe the United States can profitably use 12,000,000 cars and 3,000,000 trucks, which would require a renewal demand in excess of 2,400,000 vehicles.

Speaking as an oracle for 1923, Reeves declared that standard motor cars and trucks will be in the greatest demand, but that there will be business for the smaller companies whose products supply certain individual features.

FIRESTONE MEETING TALKS RUBBER

Authorizes Protest to Official Britian

Committee of Five Will Be Appointed to Cooperate with United States Government

WASHINGTON, Feb. 28 — Two methods of preventing increases in automobile tire prices through a rubber shortage were adopted here this week as a result of a conference between representatives of tire, automobile, accessory and other manufacturers interested in rubber production.

There was a complete unanimity of opinion as to the need of repealing the provisions of the British Colonial Act restricting rubber production and the urgency of providing new sources of rubber supply for American tire manufacturers.

The automobile industry will have representatives in the committee of five which Harvey S. Firestone of the Firestone Tire & Rubber Co. will name this week as a cooperating agency for the manufacturers and consumers in their relations with the Federal departments. It is proposed that this committee shall assist the Government in a study of the rubber situation with a view to growing rubber in continental United States and its insular possessions.

See Rising Cost of Tires

The most important emergency measure which the conference authorized is the protest to the British Government. It was the sense of the meeting that a continuation of the present restrictive taxes by British producers would place the automobile industry, as the largest consumer of rubber, in a position where it would find itself confronted with rising costs of tires.

American and British tire manufacturers in attendance at the conference called attention to the possibilities of further increases in tire prices, as there is no assurance that prices of raw rubber will not be further advanced.

Senator Couzens of Michigan, formerly identified with the automobile industry, was one of the speakers at a dinner given by Firestone. While approving of the proposal of governmental aid to the rubber industry in this instance, the Senator declared it was high time that the Federal Government defended itself against business. He said that it was a deplorable practice for industry to turn to the Government when confronted with trouble.

Senator-elect Fess of Ohio declared that inasmuch as the proposed survey and establishment of new rubber sources was a benefit to the consuming public, there could be no objection to it. He expressed the opinion that there is a tendency on the part of the industry in general to centralize and the Government must be in a position to control.

Among the representatives of the automotive industry in attendance at the conference were George M. Graham, Chandler Motor Car Co.; W. H. Smith, Ford Motor Co.; Pyke Johnson, National Automobile Chamber of Commerce; Gordon Lee, Yellow Cab Co., Chicago; M. L. Heminway, Motor and Accessory Manufacturers Association, and G. W. Brogan, Black & Decker Manufacturing Co., Baltimore.

Automotive Industry Informed

Firestone, who was the prime mover in the conference, advised the delegates that the meeting was called for the purpose of explaining to the automobile and accessory manufacturers the true situation affecting the future of the industry. He stated that the restrictive measures placed on exports of rubber by the British Government had a tendency to restrict production. It was not his intention, he said, to antagonize British officials, but to show them their error in allowing a small number of British shareholders in rubber interests to control the market.

According to Firestone, restrictive production laws not only create a grave situation, but they make it a necessity for American capital to control its own source of supply. "Suitable climatic and physical conditions," he said, "are found in the Philippine Islands, where rubber is now being produced in small quantities. Ecuador, Colombia and Venezuela are also the natural habitats of rubber, and their geographic locations recommend them."

Continuing, Firestone said:

About 1908 the tremendous growth of the motor car industry created a greatly increased demand. The British and Dutch Colonies of the Far East immediately developed larger plantations and improved their crude rubber preparation methods to meet this increased demand. Naturally the industry centered thereafter in this particular Far Eastern area. Investigations were later made in South America and in our Pacific Island possessions, the Philippines, showing that favorable conditions existed for rubber plantations in those places. But as the

(*Continued on page* 550)

SCHACHT REVISES LISTS

CINCINNATI, Feb. 23—The G. A. Schacht Motor Truck Co. has announced an increase of $200 in the price of its 4-ton and 5-ton models, the former being quoted at $4,400 and the latter at $4,600. The 2-ton, 3-ton and 7-ton chassis remain unchanged at $3,200, $3,800 and $5,050 respectively.

House Votes Fund for Rubber Survey

Appropriates $500,000 for Investigation in Latin America and Philippines

(*Continued from page* 540)

automotive development, especially in Europe.

In the world outside the United States there are now, according to statistics compiled by the Automotive Division, only 2,264,785 passenger cars and motor trucks. Outside of the United Kingdom, France, Germany, Australia and Argentina, motor traffic has just begun to become of importance.

Should a motor development occur during the next two decades in foreign countries comparable to that which has taken place in the United States since 1910, the world's supplies of crude rubber would prove inadequate. Such a development is certainly not impossible, for present practices in the most civilized countries are rapidly adopted in other parts of the world.

Dr. Cook then states that if automotive development throughout the world continues at the rate prevailing from 1910 to 1923 more than 800,000 tons of rubber would be required in 1940. He goes on to say:

What are the prospects of 800,000 tons of rubber being available by 1940? The production during the past 10 years is the result of areas planted in the Far East in the 1905-15 period, since it takes rubber trees about eight years to reach the stage when tapping may be economically carried on. If future requirements are anywhere near the continuation line from 1910 through 1923, then the planting from 1915 to 1930 would need to be approximately on the same scale as in the 1905 to 1915 period. Without a development of new plantation areas sufficient to provide 375,000 additional tons of rubber annually by 1940, a shortage of rubber is quite certain.

Restriction Always Possible

Unless rubber plantations are developed in areas outside the British and Dutch dominions, the United States will always be faced with the possibility of such restrictive measures are now being practiced in British Malaya and Ceylon. The fact that one nation controls 70 per cent of the crude rubber supply and two of them 95 per cent of it, puts monopolistic power in the hands of one or both; the only way to surely prevent the use of such power is to promote the development of plantations in other parts of the world.

NEW WARNER GEAR PRESIDENT

MUNCIE, IND., Feb. 26—Ray P. Johnson has assumed the presidency of the Warner Gear Co., succeeding his father, A. L. Johnson. He also will continue his present position as general manager of the company. The Warner company has elected W. E. Hitchcock, president of the Delaware County National Bank, vice-president, and Charles S. Davis, secretary-treasurer.

TRUCK SERVICE PLANS WORKED OUT

Provide Close Touch with Parts Stations

Manufacturers Aim Primarily to Help Dealers Rebuild and Sell Used Vehicles

DETROIT, Feb. 27—Service plans of Motor Truck Industries, Inc., as worked out by the service committee of the organization, provide primarily for the development of special tools and equipment to place servicing on the highest possible basis of efficiency, for the development of reciprocal service arrangements between members of the organization and for cultivating cooperation on service among dealers of the different manufacturing organizations interested.

Though designed fundamentally to help dealers rebuild and sell stocks of used trucks they may have on hand, the service plans of the association extend far beyond this and are intended to place the maintenance of special sized unit vehicles on a permanently stable basis. In the working out of the plans, servicing costs will be brought to lower levels by the instituting of more scientific working methods and merchandising.

To Facilitate Used Truck Sales

In clearing out remaining used truck stocks the different truck manufacturing members of the association will get reports on all trucks in the hands of dealers from field representatives and through questionnaires to be sent dealers, following servicing of these. Their sales will be further facilitated by handling them through the authorized dealer in the specific make, this to be brought about by the development of reciprocal dealer arrangements.

The service committee and the association as a whole will work toward bringing about closer cooperation between dealers and the authorized unit parts depots of the parts makers. In the several groups of parts depots practically every unit maker member of the association is now represented, and these depots with stocks running into the millions of dollars are now located in all principal cities of the country.

By the operation of the parts depots, the association points out, it will be impossible for any make of truck made of specialized units ever to become an orphan. Extension of parts stations has been gradually effected so that genuine parts at fixed list prices are available in every part of the country. All of these parts will bear the trademark of the manufacturer.

"The thought of combating pirate parts does not enter into the plans of the association," said Don F. Whittaker, general manager. "Most of the big truck users have had experiences with these, and where they were found lower priced it was because workmanship, design or material was inferior. By trademarking the genuine parts there will be no reason for truck owners accepting any others, especially when the genuine are within reach at dealers or parts depots."

In working out its service plans the association has sought to avoid the thought that the service parts business presents an opportunity to make money but rather that adequate service at low cost is an obligation of the manufacturer and dealer to the truck owner. With the unit part maker cooperating there is added a further factor of responsibility for the successful operation and maintenance of the vehicle.

Special Tools Developed

Developing of special tools for specific service operations will be done by a specialist employed by the service committee. Sets of these will be offered to dealers at low cost through their truck manufacturer. Some of these tools have been designed and the remainder will follow just as rapidly as they can be worked out. By the use of the sets, repair operations on all principal specialized units will be brought to a minimum cost.

Under reciprocal arrangement among manufacturers, dealers with any specialized unit make of truck on hand, will be enabled to get necessary parts for its rebuilding from the manufacturer of the particular vehicle at low cost. This will be handled through the service department of the factory the dealer represents, and the service department of the particular vehicle he needs to rebuild for sale.

The service committee will meet every sixty days for action on service matters affecting the association. The members are George H. Dow, Federal, chairman; Don Andrews, Continental; O. P. Bernhart, Timken; M. Kiefer, Buda; M. A. McCullough, Garford; and H. J. York, Indiana. The next meeting will be in April.

In addition to the work outlined, the committee will undertake to bring about a definite ruling by the Internal Revenue Department on excise taxes imposed on service parts. The adoption of a standardized accounting system for dealers, which includes accurate records on servicing will be urged. The committee also placed itself on record as opposed to the replacement of any unit in a vehicle with another unit not standard equipment.

New Earl Organized with Million Capital

Bank Indebtedness of Old Company to Be Funded Over Period of Four Years

CHICAGO, Feb. 27—Announcement is made here of the incorporation in Michigan of the Earl Motors Manufacturing Co., a new corporation which will lease and operate the plant of Earl Motors, Inc., at Jackson, Mich., and manage the distribution of Earl cars.

The new corporation is capitalized for $1,000,000 fully paid in, according to George C. Scobie, president, who was conferring here today with the bankers underwriting the new financing plan. All the stock is owned by the old company under an arrangement which relieves the new company of all bank debts and obligations, except current indebtedness for materials and supplies.

The bank debts of Earl Motors will be funded over a period of four years, according to an arrangement approved by the bankers' creditors committee, of which the chairman is Ralph Van Vechten, vice-president of the Continental and Commercial Banks of Chicago. A detailed financial statement of this plan is not ready for publication, Scobie said.

The purpose of this arrangement is to give the new operating company a free hand to develop and market the Earl product, in which the financial interests behind Earl Motors have great confidence. The operating company will be relieved of all financial embarrassment and will have a clear record for credit and contracting business.

Field Organization Intact

Scobie said that practically all of the Earl dealers have remained with the company through the reorganization process, although for some time production at the Earl factory has been practically at a standstill. The factory already is being operated by the new organization, Scobie said, and efforts will be directed toward speedily bringing it to capacity production of sixty cars a day. At the same time steps will be taken to enlarge the dealer organization, Scobie said.

$29,300,000 FOR ROADS

WASHINGTON, Feb. 28—President Harding has signed the Department of Agriculture Appropriation Bill containing an item of $29,300,000 for Federal aid in road building during the fiscal year of 1924, which will be sufficient to carry out the program of the Bureau of Public Roads. The Government has some funds on hand of the $50,000,000 appropriated for the current fiscal year.

Plants Have Month's Supply of Material

Steel Situation Is Most Acute—Railroad Situation Retarding Deliveries

DETROIT, Feb. 28—Stocks in practically all large plants of the industry are now reduced to approximately one month's manufacturing requirements, and while no actual shortages are reported in any particular class of material, it is exceedingly difficult to get deliveries in anything like quantities sought, owing to the generally unsatisfactory railroad conditions.

The steel situation probably is the most acute owing to the concentration of buying all at one time and the inability of the steel mills to get production beyond 85 per cent of capacity. There also is a shortage of pig iron, this giving foundries, and car companies operating foundries, a great deal of worriment and leading to a scurrying for supplies.

Industry Stocked Up Ahead

Only the wisdom of buying executives in stocking up over the winter months has carried the industry along this far without serious interruption in manufacturing schedules. Practically all factories stocked up early against poor delivery conditions during the winter, but the continuance of heavy operations during these months in preparation for spring buying has now brought these stocks to levels too low for comfort.

March manufacturing schedules will run from 10 to 20 per cent heavier than the two early months of the year. With the biggest buying months following, the question of getting deliveries on them is imperative. Only operation of the steel mills and blast furnaces at capacity will meet demands in full, officials say. With weather conditions better, the delivery problem is not regarded as especially serious, because lessening of domestic needs for coal will permit of diverting cars for industrial requirements.

Embargoes on Eastern Roads

Traffic managers at plants in this district declare that the present embargoes by eastern railroads are due largely to coal shortages in the cities and the consequent fear of public sentiment if more cars are made available for industrial needs. As a result of this, not only is the industry unable to get sufficient freight cars for shipments into eastern territory, but furnaces and steel plants are unable to get rail facilities for requirements.

There are reported to be 10,000 empty automobile cars in the eastern territory, which railroads are not even attempting to move because of the coal situation there. Without these cars factories are compelled to store their product wherever they can find space, despite the fact that dealers are ready to take cars in any quantity that they can be shipped.

Shipping finished cars will pass out of the picture as a problem from this time on, as weather conditions are rapidly becoming such that driveways can be made safely. March will witness the beginning of the big driveway movement, and there will probably be more cars shipped in that month in this way than in any other month of the year.

Factory at Janesville Is Now in Production

(*Continued from page* 537)

is general manager in charge of production, and A. P. Young is general sales manager. A skeleton organization was created by bringing experienced office and factory workers from other Chevrolet plants, but the greater part of factory labor and office help is being recruited in Janesville.

The company has taken over a club house near the plant and established it as the Chevrolet Club, for the convenience of the officials and office personnel.

Durant Sells Holdings

JANESVILLE,, WIS., Feb. 24—W. C. Durant has sold his holdings here valued at $400,000 to the General Motors Corp. He acquired the property while he was president of General Motors. Included in the purchase were the old Samson Tractor School, the Samson Engineering Building, property nearby and several lots on South Main Street.

General Motors has already sold some of the property, and H. J. Cunningham, an early buyer, reports that "General Motors does not desire to hold or deal in property except as it directly concerns factory purposes."

Ruggles Announces $795 Truck for Light Loads

SAGINAW, MICH., Feb. 28—A new model truck known as "Go-Getter" is being brought out by the Ruggles Motor Truck Co. to sell for $795. It has a capacity of 1500 lb. and is designed for use by florists, grocers, bakers, department stores, and for other work requiring light loads.

The wheel base is 118 in. and chassis weight 2400 lb. The engine has a bore of 3½ in. and stroke of 5 in., and lubrication is by a combination force and splash feed system. The ¾ ton, model 15, power plant has been changed to a Herschell-Spillman engine 3½ by 5 in.

DURANT PLANT AT OAKLAND

OAKLAND, CAL., Feb. 28—William C. Durant is planning the erection of a plant in this city to manufacture bodies for the Star, Durant and Flint cars. Engineers of the Durant Motor Car Co. of California have prepared plans for the plant, which will employ about 500 workmen. Durant will arrive in Oakland about March 3, to inaugurate the work on the new buildings.

Earl May Be Chosen as Head of National

Reported Also That Walter Anthony Will Be Named Vice-President and Treasurer

CHICAGO, Feb. 28—The board of directors of the National Motors Corp. will meet in New York late this week to take important action in completing the operating personnel of the company and approving the financing program which has been worked out.

Although members of the board in Chicago today refuse to be quoted, it is generally understood that Clarence A. Earl, creator of the Earl car and formerly president of Earl Motors, Inc., is slated to be president. If this action is taken, it means that Earl will be the active operating head of the corporation in charge of production and distribution of the new line of National cars which was announced at the New York and Chicago shows.

Another man slated for a place in the permanent organization is understood to be Walter Anthony, formerly comptroller of the Maxwell Motor Co. It is reported that Anthony will be elected vice-president and treasurer of the National corporation.

The acting treasurer since the corporation was first formed as the Associated Motor Industries has been Carl L. V. Exselsen, a Chicago lawyer, who is credited with having conceived and engineered the merger of nine automotive companies resulting in the National Motors Corp. Exselsen is a vice-president of the corporation.

Ruthenberg President Now

The acting president of the corporation since its formation has been Louis Ruthenberg, formerly general manager of the Delco Light plant of General Motors.

The other officers will continue as announced immediately preceding the New York show, it is understood. These officers are as follows:—Chairman of the board, Will I. Ohmer, formerly president of the Recording & Computing Machines Co.; first vice-president, A. A. Gloetzner, Covert Gear Co.; vice-president in charge of Louisville division, R. V. Board, Kentucky Wagon Manufacturing Co.; vice-president in charge of Indianapolis division, George M. Dickson, National Motor Car & Vehicle Corp.; vice-president, W. W. Sterling; vice-president and chief engineer, C. L. Halladay, formerly general manager, Jackson Motors Corp.; vice-president in charge of merchandising, T. C. Brandle, Traffic Truck Corp., St. Louis.

Announcement of the financing plan awaits the action of the board at its New York meeting. There will be a bond issue, probably for $3,000,000, to provide working capital. A Chicago bond company has underwritten this issue, it is understood.

Transport Inquiry Waits on Committee

Plans Will Not Assume Definite Shape Until Personnel Has Been Selected

WASHINGTON, Feb. 28—Representatives of the automotive industry today attended an executive session of the steering committee of the Chamber of Commerce of the United States, which is arranging a nation-wide study of the transportation system.

The survey into the field of motor transport will cover the relationship of highway transport to rail and water carriers. It will embrace facts and figures on comparative sums invested in highway construction, railroads and waterway facilities and equipment. The tentative plan for the inquiry into motor transportation has not been completed, and will not assume definite shape until the special committee, which will have charge of the work, is appointed.

The fact that all branches of transportation have agreed to cooperate indicates that the research will be thorough, inasmuch as the competing carriers will meet on common ground.

One of the problems which the investigators hope to solve is allocating the earnings of the highway. The railroads have a workable plan in this respect, but highway transportation on a large scale is so comparatively new that there are no reliable statistics of this nature.

January Output 240,903; Year's Total, 2,577,765

WASHINGTON, Feb. 21—The report of the Census Bureau places the total output of cars and trucks for January, 1923, at 240,903, and for the entire year of 1922 at 2,577,765.

In January of this year 221,679 cars were produced, which is nearly three times as many as were turned out in January of last year. Last month trucks built totaled 19,206.

Of the total output for 1922, 2,334,790 were passenger cars and 242,975 trucks.

The following table gives the total production for each of the last six months of 1921 and 1922 and for January of this year. With few exceptions, the reports each month are from identical firms and include approximately 90 passenger car and 80 truck manufacturers.

Passenger Cars

	1922	1921
July	224,770	165,574
August	248,118	167,705
September	187,637	144,669
October	216,099	134,734
November	215,297	106,042
December	206,372	70,690
	1923	1922
January	221,697	81,693

Trucks

	1922	1921
July	21,739	10,766
August	24,420	13,080
September	19,173	13,648
October	21,466	12,813
November	21,656	10,010
December	20,035	8,307
	1923	1922
January	19,206	9,416

GENERAL MOTORS CORP. PRODUCED 456,763 AUTOMOBILES AND TRUCKS IN 1922

New York, March 1.—Announcement is made by the General Motors Corp. that the production of passenger cars and trucks by its various units in 1922 totaled 456,763 in comparison with 214,799 the previous year. This is approximately 18 per cent of the country's total production of 2,577,763 motor vehicles.

The sales by quarters in 1922 were: First quarter, 71,039; second, 135,751; third, 112,055, and fourth, 137,918.

The sales for the year ended Dec. 31, 1922, compared with the sales of the three preceding calendar years, follow:

	1922	1921	1920	1919
Passenger Cars:				
Buick	138,501	83,888	116,213	119,853
Cadillac	22,021	11,130	19,790	19,851
Chevrolet	240,390	75,667	144,502	132,710
Oakland	20,853	12,661	37,244	54,451
Oldsmobile	21,216	20,215	26,241	33,345
Commercial Cars:				
Chevrolet	2,932	1,489	4,938	2,682
GMC trucks	5,277	2,760	5,137	7,730
Oldsmobile	1,218	466	8,383	7,782
Totals:				
Passenger cars	442,981	203,591	343,990	360,210
Commercial cars	9,427	4,715	18,458	18,194
Miscellaneous*	4,335	6,493	30,627	13,334
Grand total	456,763	214,799	393,075	391,738

* Includes tractors and also cars and trucks not now manufactured.

Government Files Tax Claim Against Willys

TOLEDO, Feb. 28—The Government has notified the receivers of the Willys Corp. that it has a tax claim against the company for $1,500,000, accumulated over the years 1917, 1918 and 1919.

If pressed, the claim, which was a surprise to the receivers who are busy liquidating the assets of the corporation, will probably delay final winding up of the affairs of the corporation for many months. Sale of the big block of Willys-Overland common stock now held by the receivers will also probably be delayed.

White Sales Last Year Were $37,000,000 Gross

CLEVELAND, Feb. 27—The White Co. sales for 1922 aggregated $37,000,000 gross, while the net earnings after all charges except dividends, were $3,700,000, according to a statement made today by the company.

The uninterrupted dividend policy of the company was continued throughout the year, and after disbursements of $2,000,000 or 8 per cent were made for this purpose, a balance of about $1,700,000 remains for 1922 to be carried to the surplus account.

In the preliminary figures issued by the company, current assets are placed at $22,068,000 and current liabilities at $5,586,000.

American Chain Has Capitalization Plan

NEW YORK, March 1—The American Chain Co., Inc., will be formed to acquire all the assets and business of the American Chain Co., manufacturer of Weed chains, bumpers, etc., under the recapitalization plan which is being put through.

The new corporation will issue 350,000 shares of Class A 8 per cent cumulative participating stock, with par value of $25 a share. The right to subscribe is to be given to present stockholders before any public offering. The new capital structure provides also for the issuance of $7,500,000 ten year 6 per cent debenture bonds.

The American Chain Co. has outstanding three classes of stock to the aggregate par value of $7,989,300, all of which are to be retired as of April 1, next. They are the 7 per cent preferred at $107 a share and dividends; the Class A stock at $110 a share and dividends, amounting to $5.50 a share, and the Class B stock at $100 a share and dividends amounting to $5.50 a share.

It is understood that both issues will be underwritten by Dillon, Read & Co. and Hemphill, Noyes & Co., and application will be made to list both on the New York Stock Exchange.

MOLINE BODY AT CAPACITY

MOLINE, ILL., Feb. 24—Orders on hand for the first half of 1923 will keep the Moline Body Corp. plant working at its daily capacity output of seventy-five bodies and maintain its full force of 500 employees, E. H. Wilson, secretary-treasurer and manager of the plant, announced today.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

Last week call loans ranged from 4½ per cent to 6 per cent as compared with 4 per cent to 6 per cent in the preceding week. The undertone was firm in time money with a fractional advance to 5 per cent for all periods from sixty days to six months, as compared with quotations of 4¾ per cent to 5 per cent in the preceding week. Trading in general was quiet, and no large transactions were effected. The prime commercial rate advanced to 4¾ per cent from a range of 4½ per cent to 4¾ per cent in the preceding week.

An important event in the week was the action of the Federal Reserve Banks of New York and Boston in advancing the rediscount rates from 4 per cent to 4½ per cent, which was done after the close of business on Feb. 21. Because of the active demand for money from every quarter, this action had no disconcerting effect on the market in general. All of the Federal Reserve Banks in the country, with the exception of San Francisco, now maintain a 4½ per cent rate.

Sterling continued its steady gain, interrupted by only a few halts, until on Feb. 21 it touched $4.72⅛ for the first time since the spring of 1919. This new high for the year caused a renewal of the expectation of sterling's return to par.

The net operating income of Class I railroads for December totaled $79,154,900, which is equivalent to an annual return at the rate of 5.15 per cent on the tentative property valuation, as compared with 3.23 per cent for December, 1921. For the full calendar year 1922 net operating income of Class I railroads was $776,421,400, which was equal to 4.14 per cent return on the tentative property valuation and compared with $615,945,600, or 3.28 per cent for 1921. During the year, 1922, operating expenses, notwithstanding the railway shopmen's strikes, were reduced 3.2 per cent, in comparison with 1921, while the volume of traffic for the year increased 9 per cent.

Decision Awarded Acme in Visor Patents Suit

NEW HAVEN, CONN., Feb. 26—Judge Thomas of the United States District Court, District of Connecticut, has handed down a decision in the suit of the Acme Motor Shield Corp., Charles O. Foedisch and Roy J. Foedisch against the Roberts Manufacturing Co. of this city upholding the validity of the Foedisch patents covering collapsible and adjustable visor as an automobile accessory. The court holds that the Roberts company's visor, being changed only in the form of mounting the supporting arms and the roller, infringes on the Foedisch visor as made by the Acme company, which is a Baltimore concern.

The Foedisch patent as described in Claim 1 covers a visor which is a roller and frame extending longitudinally with the rollers; ends in which the roller is mounted on the frame; extensible curtain on the roller; supporting arms adjustably mounted on the ends of the frame respectively to permit them to be shifted in a plane transverse to the axis of the roller; means for holding the arms in an adjusted position and means for connecting the free ends of the curtain to the side arms to hold the curtain extended.

Roberts Not Making Roll-Up Visor

NEW HAVEN, CONN., Feb. 27—"The Roberts company discontinued making roll-up visors nearly a year ago. The Sunburst, the only visor now being made by us, is not at all affected by the patent suit," the Roberts Manufacturing Co. states with reference to Judge Thomas' decision.

Curtiss Plans Provide More Working Capital

NEW YORK, Feb. 26—A recapitalization plan will be submitted to stockholders of the Curtiss Aeroplane & Motor Corp., which is designed to cut down outstanding stock issues and provide additional working capital.

The company's balance sheet shows net profits last year, after all charges, were $16,170, compared with $101,207 in 1921. This decline in profits is explained by the expense of developing the company's new engine.

Cash on hand at the close of the year was $174,744, against $994,880 the previous year. Government work in production at the close of the year, however, totaled $791,978, compared with $122,629 the previous year.

Most of the company's business comes from the Government, and it is reported that there is enough business on the books to keep the plants busy well into 1924.

Moon Earnings $913,883 Against $120,051 in 1921

ST. LOUIS, Feb. 27—Net earnings of $913,883 as against $120,051 in 1921 are shown in the annual report of the Moon Motor Car Co.

After allowing for taxes and payment of preferred dividends, net income was $773,341, equal to $5.01 a share on the 154,213 shares of no par value common stock outstanding. Net income was $77,575 or 50 cents a share on the stock outstanding at the end of 1921.

Gross sales of passenger cars, accessories and parts in 1922 were $5,877,159 compared with $3,505,880 in 1921. Operating and administrative expenses were $6,159,635.

Net current assets of $1,805,616 as against net current liabilities of $563,762 are shown on the balance sheet as of Dec. 31, at which time inventories were $794,610 compared with $435,024 at the close of 1921.

The company's schedule calls for the production of 15,000 cars this year.

FINANCIAL NOTES

Michigan Securities Commission has given approval to the Stout Metal Airplane Co. to issue $299,000 in preferred stock and 60,000 shares of no par value common. The issuance of 500,000 shares of common by the Dare Aircraft Co. has also been approved. Both of these companies propose to manufacture all-metal planes in Detroit for general commercial work. Approval of the commission also has been given to the issuance of $850,000 first mortgage 6½ per cent serial gold bonds by the Campbell, Wyant & Cannon Foundry Co., Muskegon. Erdman-Guider Co., body builder, is granted approval of issues of $400,000 preferred and $100,000 common, and Limousine Body Co. of $75,000 first mortgage 7 per cent bonds.

Fisher Body Corp. stockholders have been notified of a special meeting in New York March 6 to ratify the proposal of increasing the capital stock to 600,000 shares, the number of shares to be issued being 160,000, of which 60,000 are preferred at $100 par and 100,000 no par. The proposal to reduce the directorate from 14 to 11 members will also be acted upon. Present earnings indicate that Fisher will earn about $20 a share outstanding on capital stock this year, which compares with $11.20 earned last year. Earnings are now running nearly 100 per cent better than in any previous year. Net earnings before interest and taxes in the last two months of 1922 were $2,962,885.

Checker Cab Manufacturing Co., New York, has put on the market 25,000 shares of class A participating stock at $55 a share. The stock is preferred as to cumulative dividends up to $5 a share and entitled to dissolution in preference to class B common stock to $55 a share. The company's capitalization consists of 30,000 shares of class A participating stock and 100,000 shares of class B common stock, of which 25,000 shares of the former and all of the latter are outstanding. This new financing will enable the company to start with liquid assets in excess of $1,000,000 over and above liabilities. The company reached an output of 112 taxicabs in January.

Fisher Body Corp. and subsidiaries exclusive of the Ohio company for the three months ended Jan. 31, 1923, report a surplus amounting to $4,020,770 after charges and Federal taxes, equivalent after allowing for preferred dividends to $7.39 a share for the outstanding 500,000 shares of no par common, compared with a surplus of $2,852,963, or $5.60 a share for the preceding quarter. The nine months surplus amounted to $8,607,164, or $16.88 a share. The surplus of the Fisher Body Ohio Co. for the quarter was $752,711 after Federal taxes, while for the nine months it was $1,577,280.

Mullins Body Co. reports net sales of $2,144,470 in 1922 against $1,431,243 in the previous year. Net profits after taxes, etc., amounted to $113,273, against a loss of $115,140. After payment of preferred dividends there was a surplus of $35,673 available for the common stock, against a loss of $322,879 after common and preferred dividends in 1921.

Wisconsin Top Co., Inc., Racine, Wis., maker of closed tops and other fabric automotive equipment, is marketing an issue of $100,000 of 7 per cent cumulative preferred stock to provide working capital needed to accommodate its increased business.

Du Pont Motors, Inc., Wilmington, Del., has filed notice with the State Department of that State of an increase in capital stock from $4,500,000 to $25,000,000.

California Reports Greatest Sales Gain

Increase in January of This Year Was 126 Per Cent Over Same Month of 1922

OAKLAND, CAL., Feb. 26—The automotive industry is having the most auspicious opening in California for this year that it has had for any year in its history, according to figures compiled by "Motor Registration News," published in this city. These figures show that total sales of automotive vehicles in California for January, 1923, were 15,109, as compared with 6694 in January, 1922, an increase of 126 per cent, the largest gain ever made in any single month of automotive history in California.

Of this total, southern California purchased 9410, a gain of 115 per cent over its record for January, 1922. The northern part of the State bought 5699 automotive vehicles in the first month of 1923, a gain of 147 per cent over its purchases for the same month last year. In passenger car sales the State gained 127 per cent for January, 1923, over January, 1922, while for the same months, trucks showed an increase of 111 per cent. Of the fourteen leading counties as listed by the figures taken from the State's registration books, one gained 374 per cent, and there are several which made gains of more than 200 per cent.

Dallas

DALLAS, TEX., Feb. 28—Despite bad weather, practically every line of the automotive business showed increased business during February in Dallas and most of Texas. This was especially true in the retail sale of automobiles and trucks.

Practically every dealer in Dallas reported his sales better than for the same month of 1922. The selling of cars was not confined to any style or price. There was a considerable amount of trade-in business in connection with the February trade.

Cleveland

CLEVELAND, Feb. 28—Records in the office of the county clerk in this city show that sales in January, 1923, were 60 per cent above the mark reached in the corresponding month of last year, while in February the increase will approximate 12 per cent over February, 1922.

The transfers of sales of cars filed in the clerk's office in January, 1922, totaled 3945, while last month the number was 6580.

In February of 1922, which was the month when things began to move along rapidly in this city, the transfers recorded were 5351. On February 26, 1923, 6000 had been recorded. A number remained to be filed, and it was stated that at the present rate the total for the month would reach 6700.

During January 70 per cent were closed cars, but with the advent of February and the first indications of spring, sales of open cars have increased. In the last week of February, phaetons that had stood in dealers' store rooms most of the winter began to move.

INDUSTRIAL NOTES

Wheeler Radiator & Manufacturing Co. of Cleveland, making truck radiators, has appointed C. J. Edwards & Co. as general sales agents. C. J. Edwards and H. M. Bock, 135 High Street, Detroit, will cover the Detroit and Cleveland territories, while B. S. Pheiffer, vice-president of the sales company, will handle Chicago and surrounding territory from 531 First National Bank Building, Chicago.

French Battery & Carbon Co. of Madison, Wis., experienced a 50 per cent increase in production and sales in 1922, compared with the previous year, according to reports presented to the annual stockholders' meeting. The concern is at present employing 600 people, with a payroll averaging $700,000 annually. J. B. Ramsey was re-elected president and treasurer.

McQuay-Norris Manufacturing Co. has purchased the plant and business of the Victor Bearings Co. of Indianapolis, which adds a complete line of crankshaft and connecting rod bearings to the McQuay-Norris line of piston rings and pins. The Victor company is an outgrowth of the Modern Die & Tool Co., which had produced bearings for nearly twenty years.

Connecticut Telephone & Electric Co. of Meriden, Conn., is preparing to erect a new factory building as soon as weather conditions permit. It will be built of iron and concrete, and will be devoted to the general expansion of the business.

Atlas Forge Begins Year with Many Orders on Hand

DETROIT, Feb. 24—Atlas Forge Co. business in 1922 exceeded 1921 by a half million dollars, and the company is entering 1923 with more than a million dollar's worth of business on hand, according to the report filed at the annual meeting this week. All departments are working full time, and overtime operations are being maintained in some of them.

The company is protected against advancing raw material prices and has a steel inventory sufficient for three months. There is little possibility of a slackening of operations for at least six months. All former officers and directors of the company were re-elected.

WIRE WHEEL ELECTION

BUFFALO, Feb. 27—J. Linde Hopkins of the Hendee Manufacturing Co. was elected a director of the Wire Wheel Corp. of America at the annual meeting. This was the only change in the directorate, all the retiring directors being reelected.

METAL MARKETS

Prices for finished steel products have now reached a level slightly higher than the index number of commodities at wholesale of the Department of Labor, so that the market may be said to have attained that harmony with the general run of commodity prices lack of which during the fall of last year was complained of time and again by the leaders of the steel industry. The more forward looking ones among these would have preferred to see labor, freight rates and other commodity prices deflated to what was then the level of steel products, and it was only when they saw the impossibility of bringing this about that they yielded to the pressure of equalization, and permitted the steel market to climb.

The question now is whether they will be able to prevent prices for steel products from reaching heights that would bring back all the vicissitudes of the interminable circle of inflation. There is already some talk of further wage advances, and if these are granted in spots and resisted in others, it will mean lessened output which in the face of the pressure by consumers for supplies will result in still more extravagant delivery premiums than those now in vogue. For a compass in these rather troubled waters one must necessarily go back to the beginning of the 1920 post-armistice boom. Comparison of the prices then prevalent with those now in effect show a wide divergency between the various products. Steel bars, for instance, sold $2 per ton higher before the 1920 boom set in than at the present, and it was not until the 1920 period had become obviously critical that steel bars were quoted at around 3.30 cents, or approximateiy $20 a ton higher than at present.

Sheet bars became "scarce" during the last two months of 1919, and at the opening of 1920 were quoted at $50. They are even more difficult to obtain at a reasonable figure today, and the somewhat nominal quotation of $42.50 does not appear to appeal to mills as sufficient inducement to let go of more than very light tonnages. It is in sheets that the situation today is much like what it was in January, 1920. Black sheets are quoted by the independents today at 4.60 cents, which was the January, 1920, average. By March of 1920 sheet prices had advanced more than $20 a ton, and kept climbing until in September they sold at 7 cents. November brought the crash which caused all steel prices to tumble. Buyers are now asking themselves to what extent the 1923 situation will parallel that of 1920. Conditions are different today. The demand is more healthy. In fact, the more optimistic among the producers are of the opinion that it will continue over the entire year and keep their mills in profitable operation.

Pig Iron.—While the pig iron market, especially that for foundry irons, is usually a thing utterly apart from that for steel, the confidence of blast furnace interests in further advances is largely a reflex of steel market conditions.

Aluminum.—Importers and holders of resale ingots are asking within ½ cent of the domestic producer's price. Fresh European arrivals are as scarce as fresh demand, most of the automotive consumers having covered their wants for the year's first half.

Copper.—The enthusiasm with which copper and copper and brass products prices have been marked up is exceeded only by that displayed in those quarters where 20 cent copper is prophesied. Copper is still below the average price for the last 20 years, which is 17 cents.

Calendar

SHOWS

May 13-20 — New York, Spring Salon, Hotel Commodore.

Nov. 4-10 — New York, First Automobile Salon of the Foreign Automotive Association, Hotel Astor.

FOREIGN SHOWS

March 31 - April 29 — Madrid, Spain, International Automobile Exposition at the Palacio de Exposiciones, showing automobiles, motorcycles, accessories and equipment, under the auspices of the Chambre Syndicale de l'Automobile et du Cycle.

May 9 - June 12 — Gothenburg, Sweden, International Automobile Exhibition, Sponsored by the Royal Automobile Club of Sweden.

Oct. 4 - 14 — Paris, Passenger Cars, Bicycles, Motorcycles and Accessories, Grand Palais.

Oct. 24-Nov. 2—Paris, Trucks, Agricultural Tractors, etc., Grand Palais.

RACES

May 10 — Berlin - Grunewald, German Grand Prix.

May 30—Indianapolis, Eleventh Annual 500-mile International Sweepstakes.

July 2 — Tours, French Grand Prix 500-mile race.

CONVENTIONS

May 2, 3, 4 — New Orleans, Annual Convention of the National Foreign Trade Council.

May 7-12—Seville, Spain, Fourth International Highway Congress.

May—New York, Annual Convention of the United States Chamber of Commerce.

Oct. 24-26—Cleveland, Thirtieth Annual Convention of the National Association of Farm Equipment Manufacturers, Hotel Statler.

S. A. E. MEETINGS

Metropolitan Section

March 15—Speaker, William P. Kennedy, President, Kennedy Engineering Corp.; Subject, Trolley Buses and Flexible Vehicles for Street Railway Service.

April 19—Speaker, Edw. E. La Schum, General Superintendent, Motor Vehicle Equipment, American Railway Express Co.; Subject, Engineering Features of Fleet Operation.

May 17—Speaker, F. P. Gilligan, Secretary, Henry Souther Engineering Co., Subject, Metallic Materials for Automotive Work.

Other Meetings

April 26-28—Cleveland Section—Automotive Transportation.

June 19-23—Summer Meeting of the S. A. E.—Spring Lake, N. J.

October—Production Meeting of the S. A. E.—Cleveland.

S. A. E. Hears Paper on Marine Engines

NEW YORK, Feb. 28—The principal paper read at the Motor Boat meeting of the Society of Automotive Engineers, held at the Hotel Commodore today, was written by Col. J. G. Vincent of the Packard Motor Car Co. and outlined the general requirements for comparatively high speed marine engines, such as are generally used in speed boats. It was presented by L. M. Woolson of the Packard engineering staff.

It is pointed out that this type of engine is similar in many respects to aircraft engines, since it must be light and economical as well as durable.

Conditions to be met in respect to cooling, lubrication, starting, idling and general operation, which are different in some respects in marine service from those applying in aeronautic service were discussed in more or less detail.

Woolson laid emphasis upon the fact that in the case of a certain 300 hp. engine, the equivalent of as much as 84 hp. was absorbed in the lubricating oil, consequently special provision must be made for adequately cooling the oil.

Desirable Engine Qualities

In the discussion of the paper one marine engine designer made the statement that engines which give a high power output per unit of weight, together with minimum fuel consumption, are desirable in marine service as well as in aircraft service, but that these qualities are sometimes secured at the expense of long life or excessive first cost.

To this Woolson replied that light weight is by no means incompatible with durability, although it unquestionably adds to first cost, an item which is not of prime importance, however, because of the fact that such engines are intended for racing service where first cost is secondary to performance.

In support of the statement that an engine can be made light and still be made durable, Woolson drew attention to the fact that the Navy Department is now requiring that lightweight aircraft engines be capable of operation for 300 hours at practically full load without requiring overhauling. This has resulted in engines which are both light and durable.

Woolson stated that the Packard Co. is now engaged in laying down the design of an engine of about the same size as the Liberty engine but weighing some 200 lb. less. The cylinders, which are 5⅛ in. bore, weigh 9 lb. each, while the stresses in all important parts are lower than they were in similar parts of the Liberty engine.

Another engineer in the marine field said that even the Liberty engine has established the fact beyond question that an engine can be made of light-weight and still prove exceptionally durable.

Other discussion had to do largely with a criticism of inaccessibility and the lack of adequate standardization in the marine field which has led to many difficulties both on the part of parts makers and of users who demand service.

The concluding paper of the meeting, read by George A. Colley, dealt with the application of the Diesel engine to seagoing yachts.

Murphy Sets New World's Record at Los Angeles

LOS ANGELES, Feb. 26—A new world's record for 250 miles was created yesterday when Jimmy Murphy in a Durant Special won the first of the 1923 championship events over the Berkeley Oval speedway. Murphy turned the distance in 2 hr. 9 min. 43.61 sec., an average of 115.8 m.p.h. The old mark was 114.6 m.p.h., also made by Murphy when he won the big race here last December.

DORT EXPORTS INCREASE

DETROIT, Feb. 27—Export business for the Dort Motor Car Co., in the first three months of the company's new fiscal year have exceeded business in the same period in the former year by 62 per cent, according to A. C. Germann, director of foreign sales. This period comprises November, December and January.

Firestone Meeting Discusses Rubber

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supply from the Far East proved adequate, it was not until the passage of British laws restricting exportation of rubber from their plantations, in order to increase the market price, that the rubber and automotive manufacturers of the world came to realize their utter dependency upon British interests for their crude rubber supply.

Because of the inflexibility and unsoundness of the restriction act many conversant with the situation foresee an actual shortage of rubber before the end of the year and as a result the cost of tires will necessarily advance, adversely affecting the use of automobiles and the development of highway transportation.

The matter has reached a crisis and it is important that the industries affected by this measure should be informed about the situation. Cooperation and organized effort on the part of the American manufacturers concerned is sure to result in the repeal of the legislation for it is admittedly unsound economically and contrary to British government policies and tradition.

Ford Investigated Situation

W. H. Smith, research engineer of the Ford Motor Co., told the conference that several years ago the Ford company had conducted a thorough investigation into the sources of rubber supply and rubber production with a view to manufacturing tires and other rubber goods. The survey showed the engineers that it would not be economical, inasmuch as this branch of the automobile industry had been developed satisfactorily by the tire manufacturers.

Smith was firmly of the belief that the American automotive industry should not be dependent upon any one government for its supply of rubber.

Speaking on behalf of organized tire manufacturers in Great Britain, Philip H. Lockhart, tire manufacturer of Leicester, England, advised the conference that his associates were strongly opposed to the restrictive measures imposed by the British Government. He declared that any movement undertaken by American tire manufacturers to obtain relief from this legislation would have the hearty support of the British manufacturers.